US011142903B1

(12) **United States Patent**
Jones, Jr. et al.

(10) **Patent No.: US 11,142,903 B1**
(45) **Date of Patent: Oct. 12, 2021**

(54) **PROTECTIVE ENCLOSURE FOR INTERIOR AND EXTERIOR SPACES**

(71) Applicant: **NetTalon Security Systems, Inc.**, Fredericksburg, VA (US)

(72) Inventors: **Donald R. Jones, Jr.**, New Canton, VA (US); **Len R. Christensen**, Florence, OR (US)

(73) Assignee: **NETTALON SECURITY SYSTEMS, INC.**, Fredericksburg, VA (US)

(*) Notice: Subject to any disclaimer, the term of this patent is extended or adjusted under 35 U.S.C. 154(b) by 0 days.

(21) Appl. No.: **17/160,051**

(22) Filed: **Jan. 27, 2021**

Related U.S. Application Data

(60) Provisional application No. 63/039,450, filed on Jun. 15, 2020.

(51) **Int. Cl.**
E04B 1/344 (2006.01)
E04H 9/14 (2006.01)
E04H 9/06 (2006.01)

(52) **U.S. Cl.**
CPC ***E04B 1/3445*** (2013.01); ***E04H 9/06*** (2013.01); ***E04H 9/14*** (2013.01)

(58) **Field of Classification Search**
CPC E04B 1/34357; E04B 1/3445; E04B 1/344; E04B 1/3442; E04H 9/04; E04H 9/06; E04H 9/10; E04H 9/14; F41H 5/14; F41H 5/24
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

3,984,949	A *	10/1976	Wahlquist	E04B 1/3445 52/70
6,874,284	B1 *	4/2005	Hayward	E04H 1/1261 52/220.2
7,934,444	B2 *	5/2011	Carberry	F41H 5/24 89/36.02
2003/0051825	A1 *	3/2003	Toepel	G21F 3/04 160/135
2007/0012168	A1 *	1/2007	Weatherwax	F41H 5/06 89/36.04
2009/0090475	A1 *	4/2009	Raniere	E04B 2/7431 160/351
2010/0192493	A1 *	8/2010	Nakai	E04B 2/7448 52/239

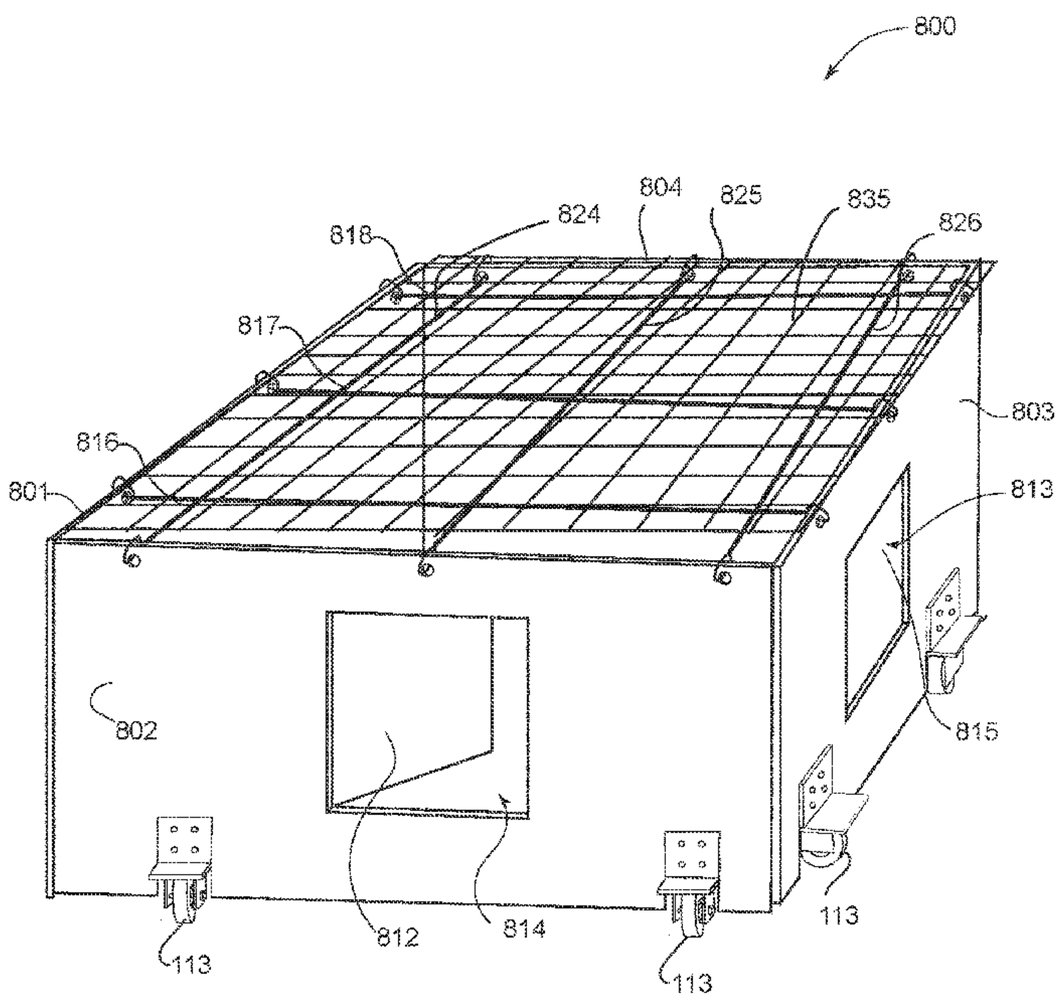
(Continued)

Primary Examiner — Christine T Cajilig
(74) *Attorney, Agent, or Firm* — Scott E. Gilbert

(57) **ABSTRACT**

Disclosed herein is a protective enclosure deployable within an interior space such as a school classroom or an office, or an exterior space. The deployable protective enclosure is to protect multiple occupants against projectiles such as flying or falling debris resulting from a natural disaster such as a tornado, hurricane or earthquake, or rounds fired. Occupants may be corralled into the protective enclosure and be protected against projectiles. The protective enclosure comprises three or more articulated partitions comprising ballistic materials or high-impact resistant materials. The protective enclosure may be affixed to one wall or two walls at a corner of a classroom, office or other space. The articulated partitions may be readily and rapidly secured in a protective configuration, forming a triangular, square or other polygonal enclosure. When not in use, the partitions may be folded and stowed against the walls.

20 Claims, 16 Drawing Sheets



(56) **References Cited**

U.S. PATENT DOCUMENTS

2014/0174284	A1*	6/2014	Peters	F41H 1/00 89/36.02
2015/0315776	A1*	11/2015	Duncan	A01K 3/00 52/66
2019/0353465	A1*	11/2019	Muth	F41H 5/24
2020/0248990	A1*	8/2020	Larson	F41H 5/04

* cited by examiner

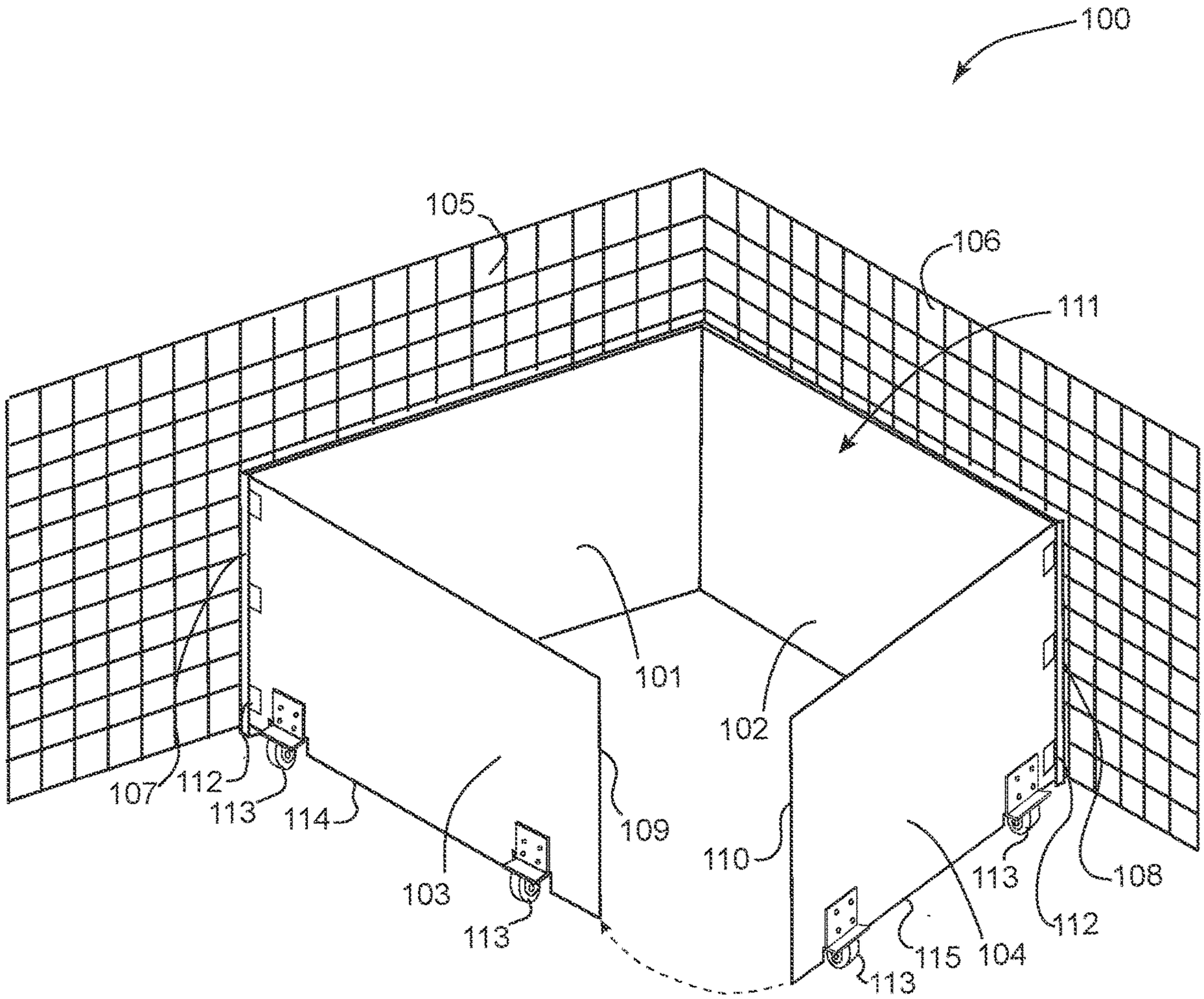


Fig. 1a

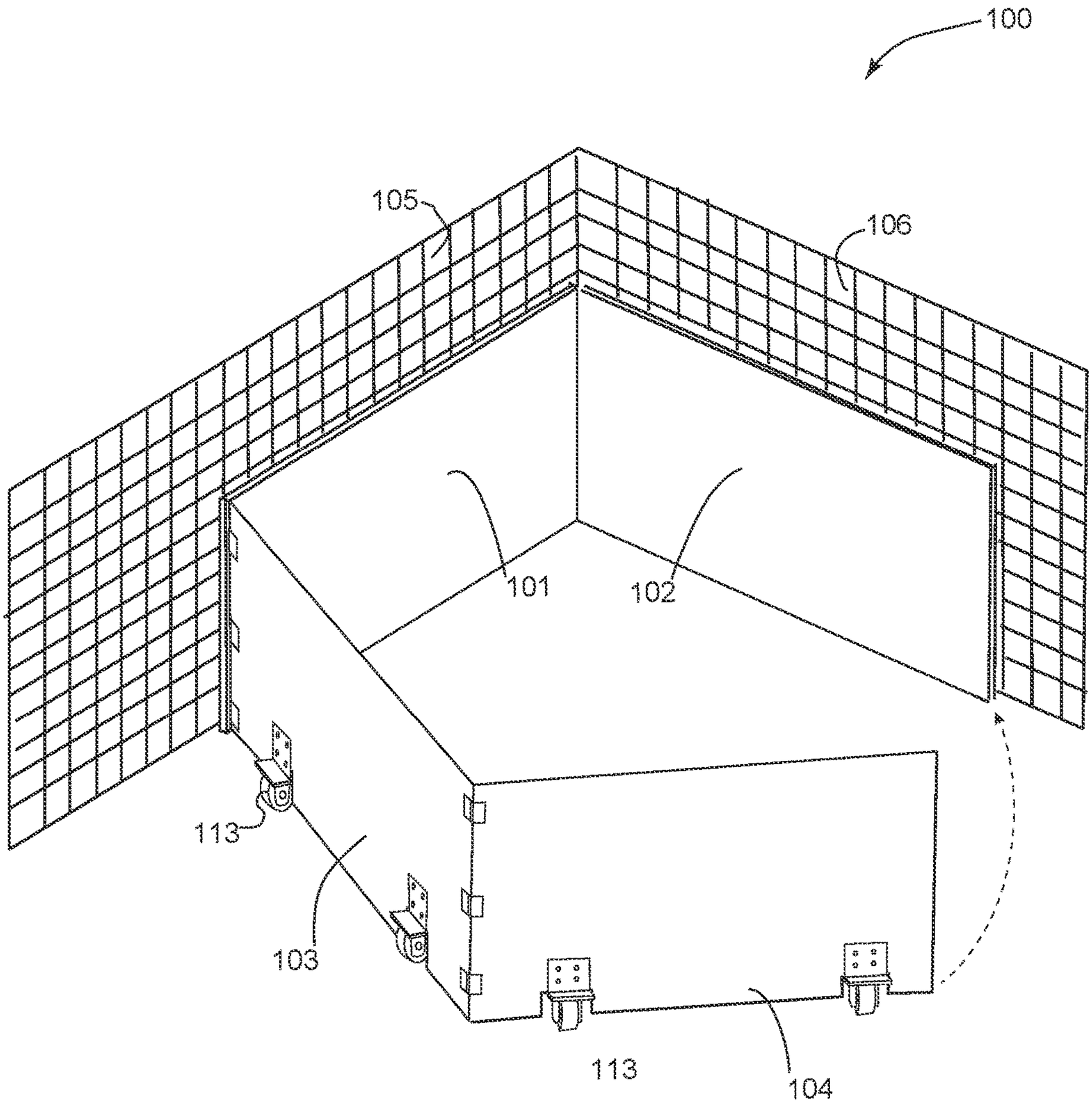


Fig. 1b

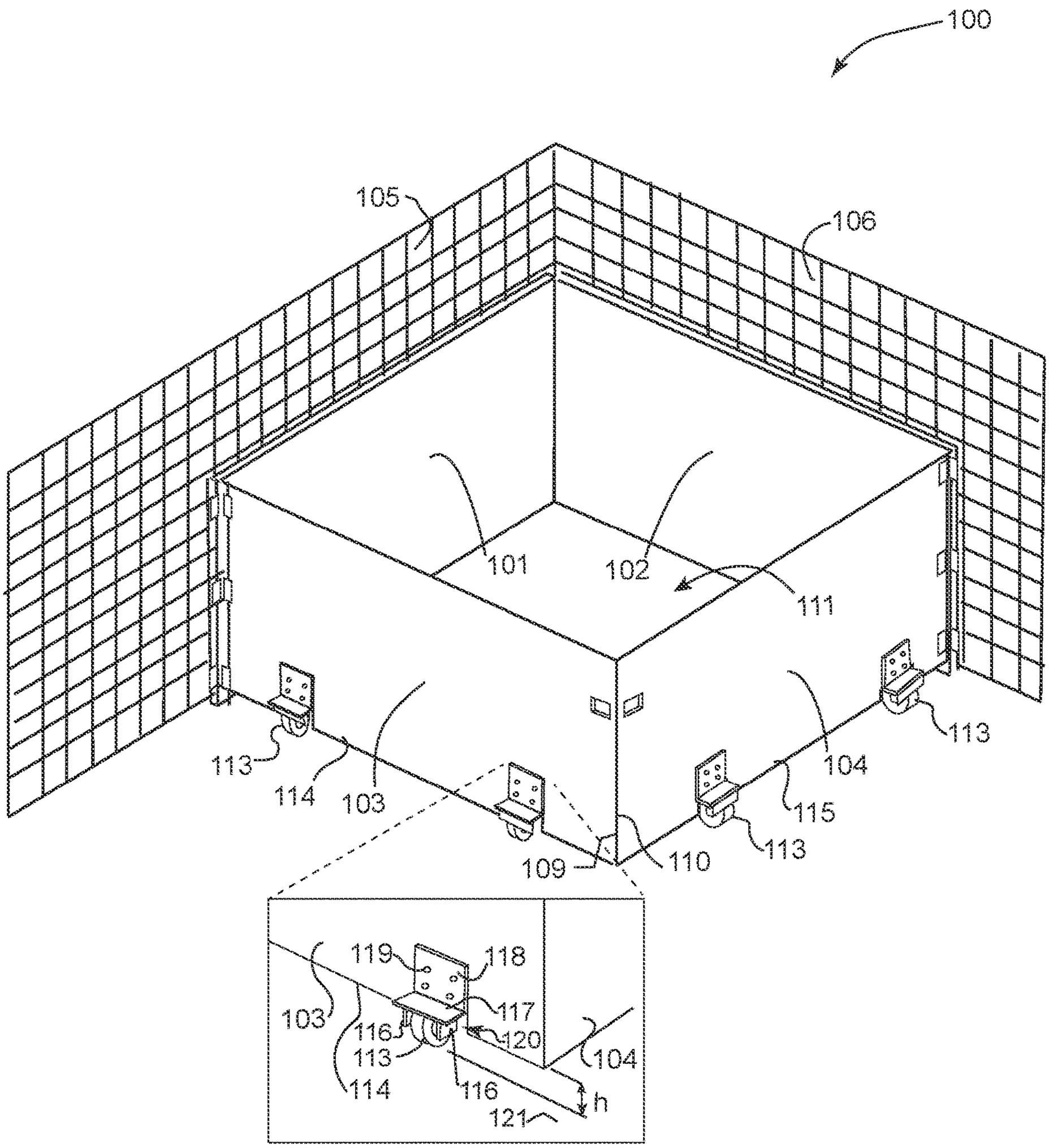

100
105
106
101
102
111
113
114
103
104
115
113
109
110
113
119
118
117
103
116
120
104
113
114
116
h
121

Fig. 1c

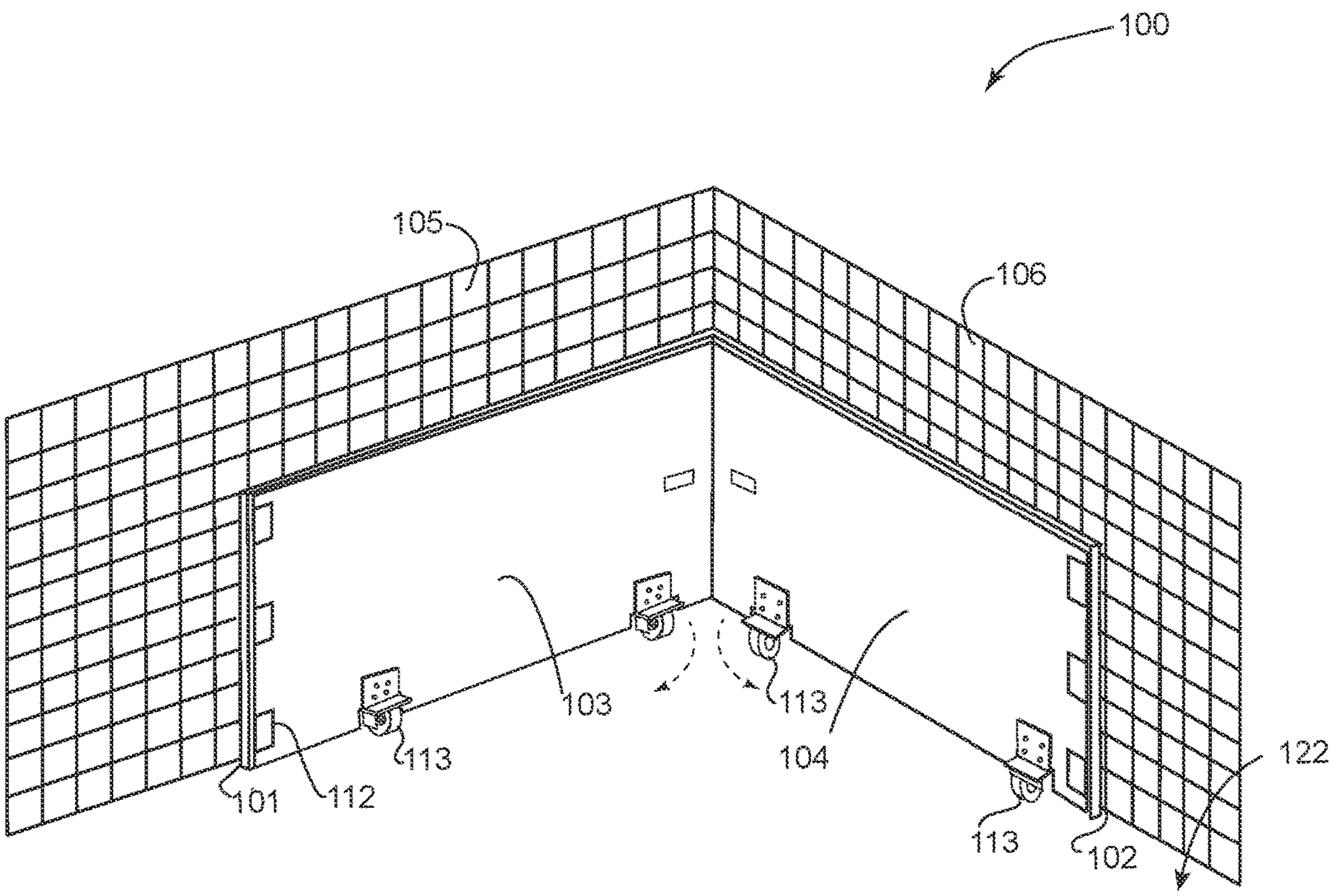


Fig. 1d

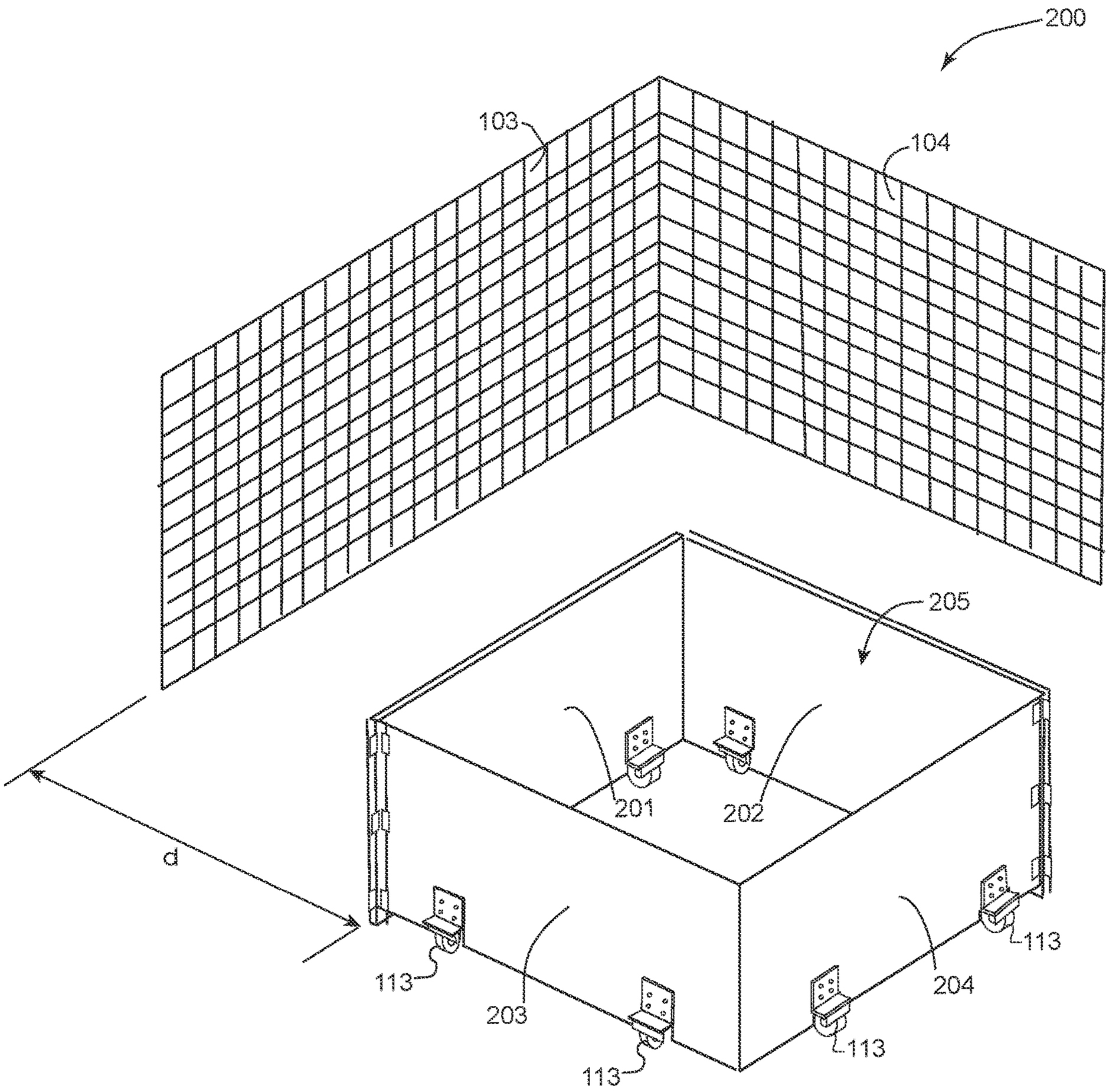


Fig. 2

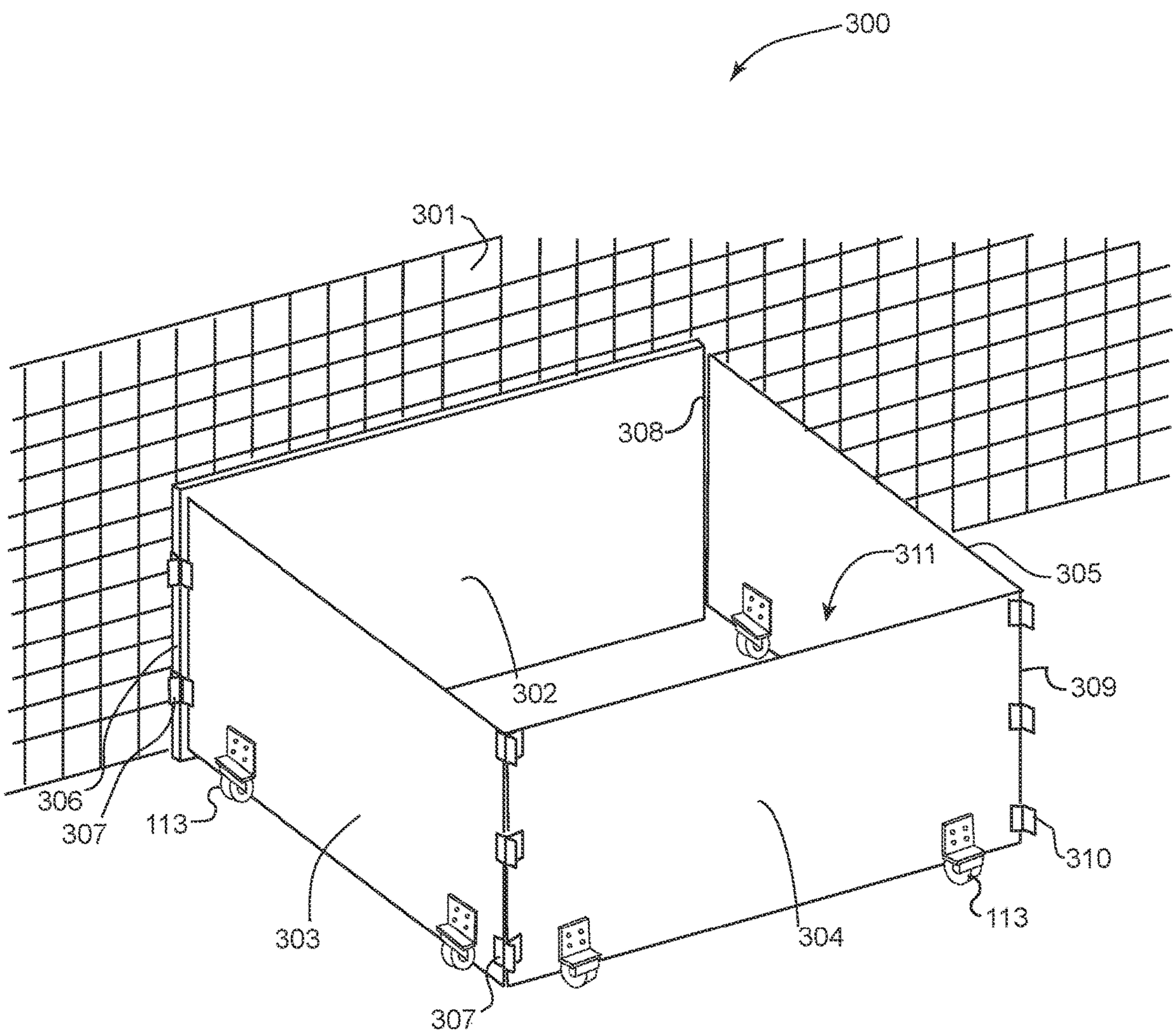


Fig. 3a

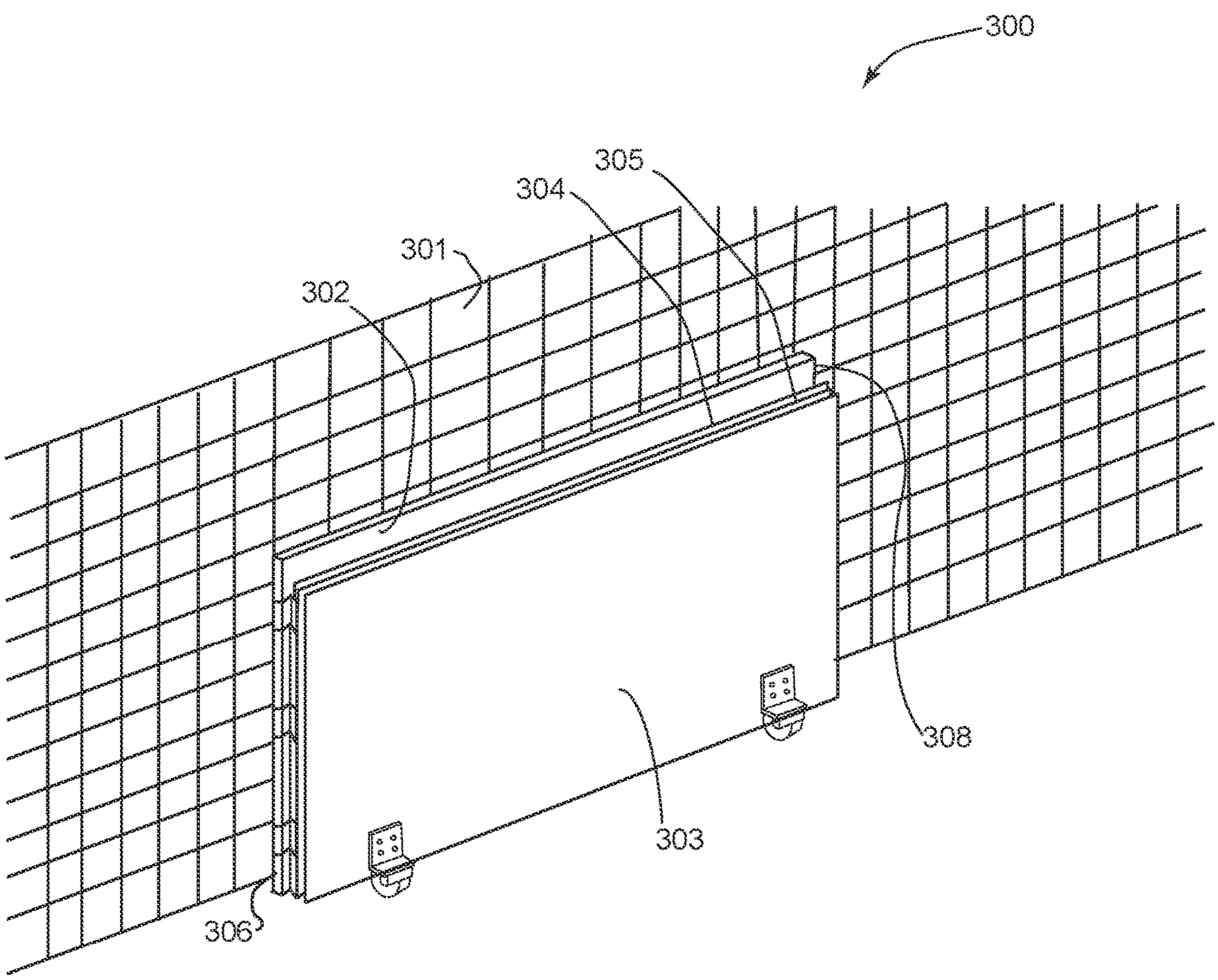


Fig. 3b

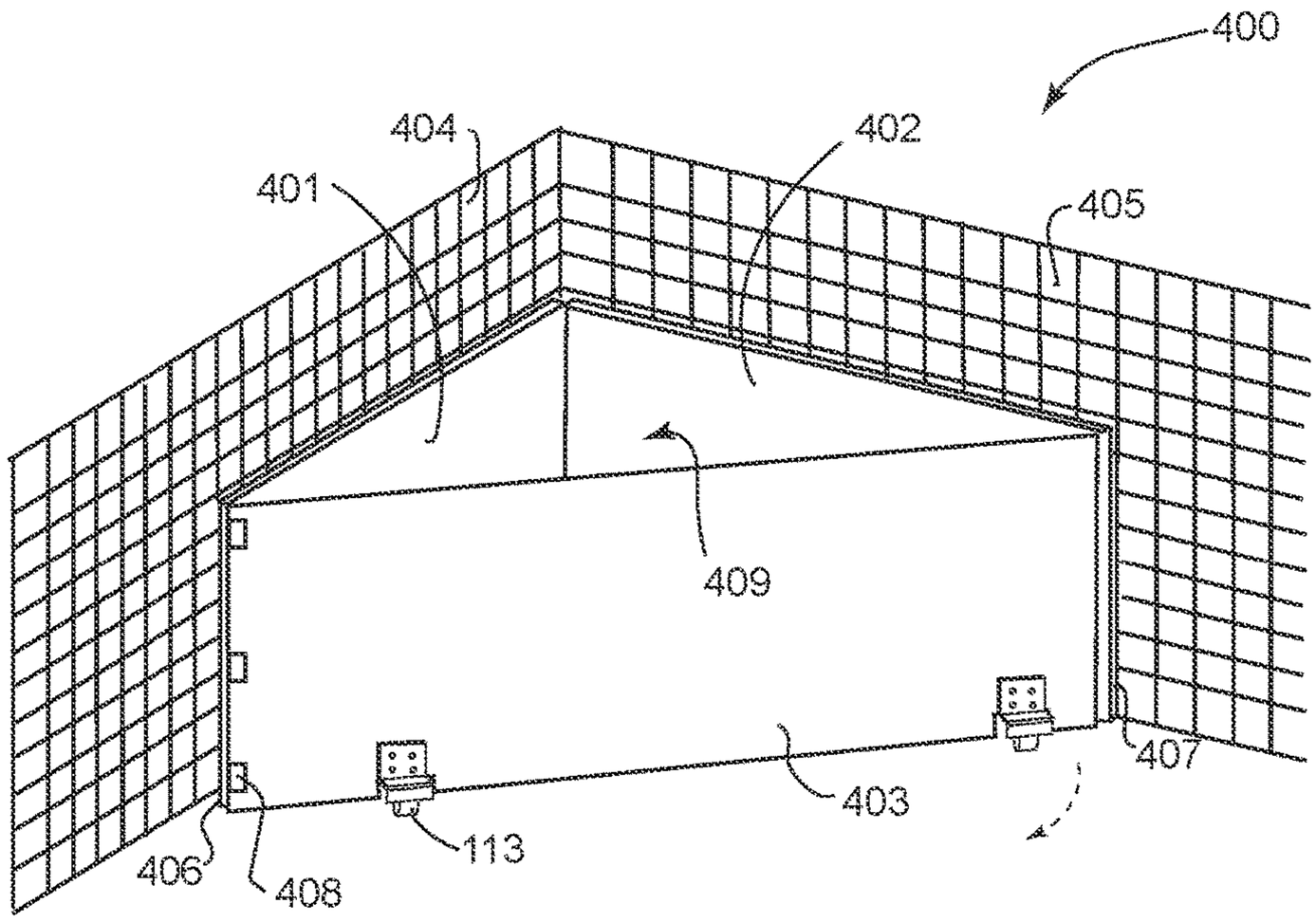

400
404
402
401
405
409
407
403
113
406
408

Fig. 4a

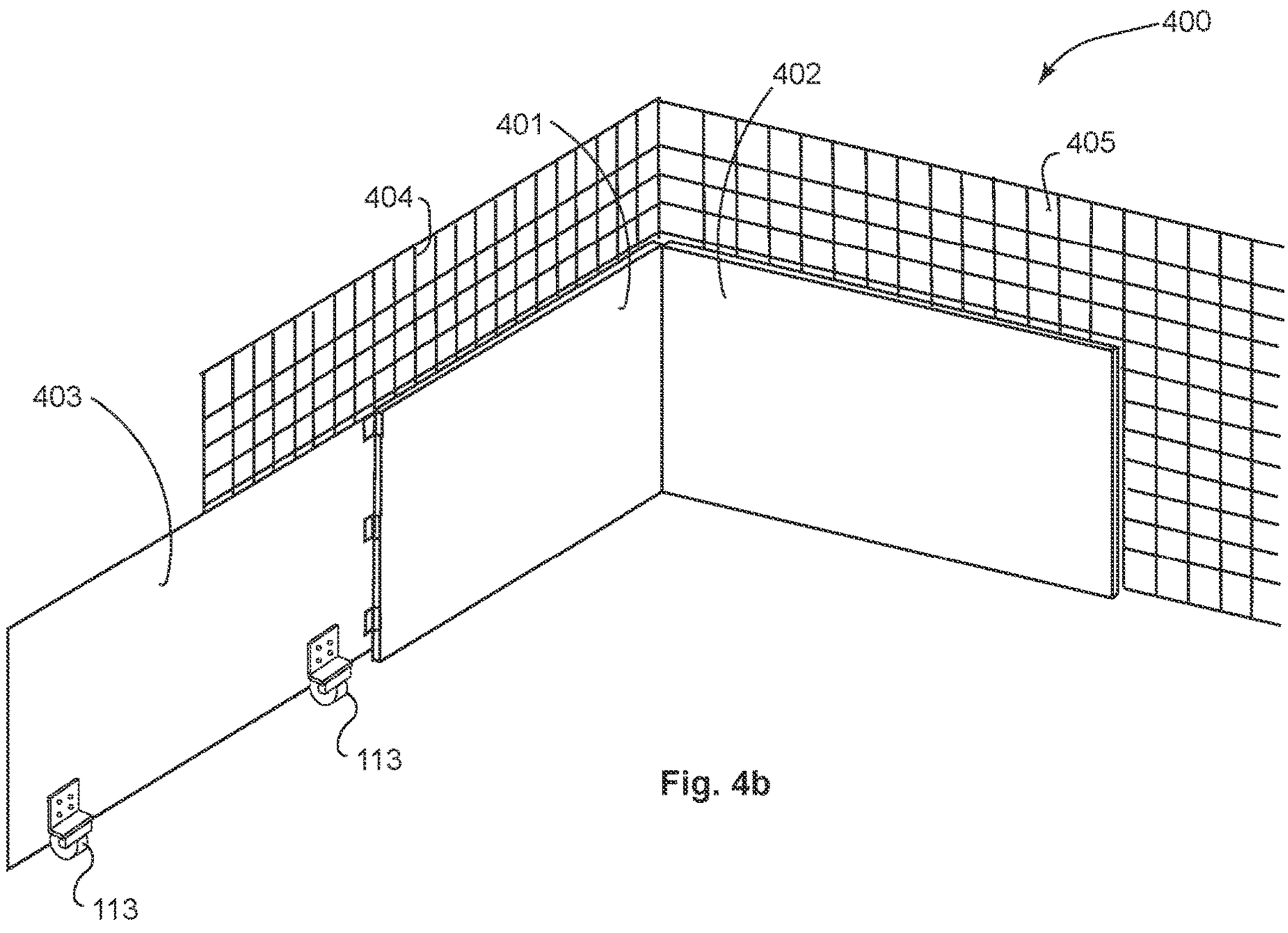

400
402
401
405
404
403
113
113

Fig. 4b

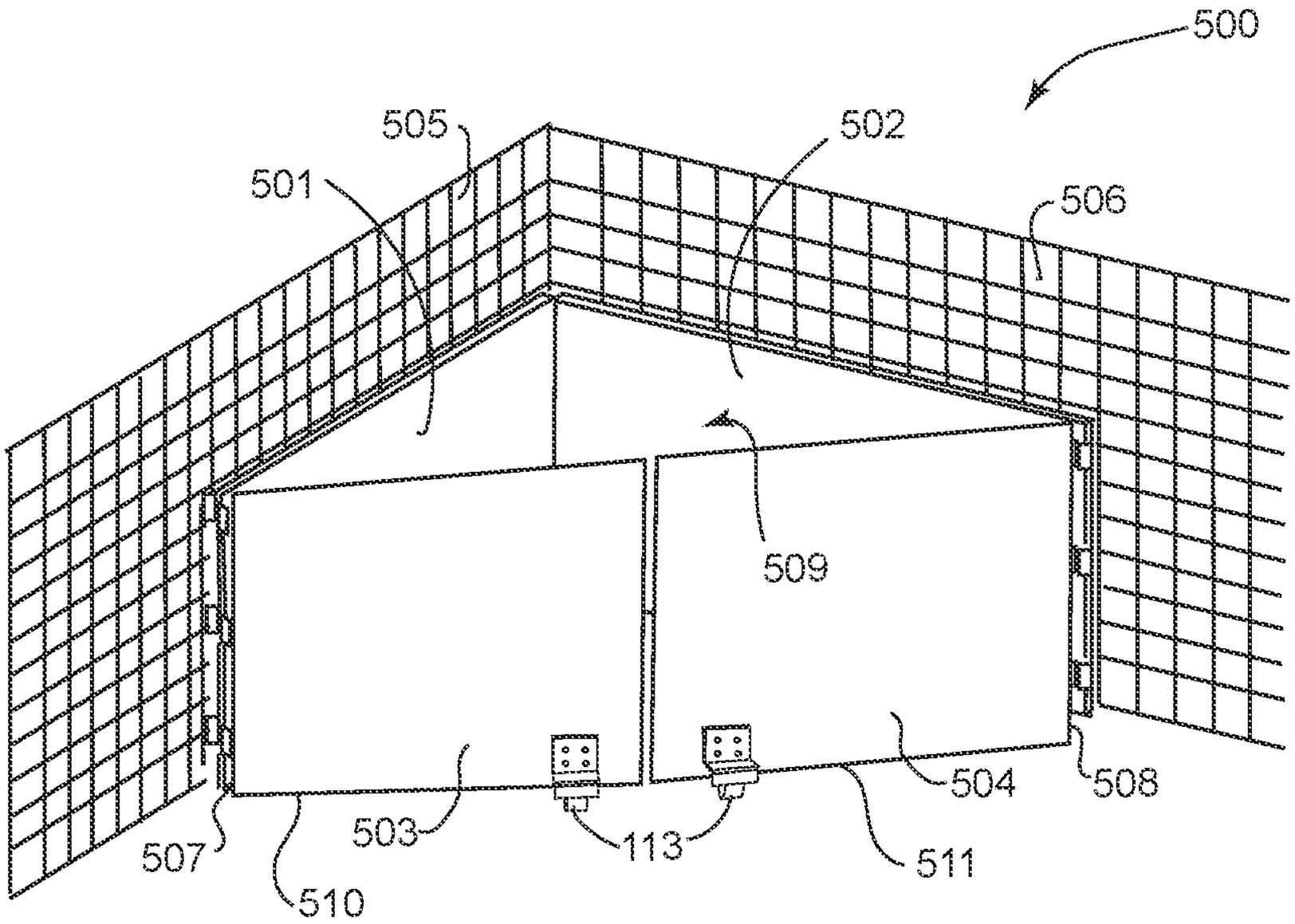

500
505
502
501
506
509
504
508
503
113
511
507
510

Fig. 5a

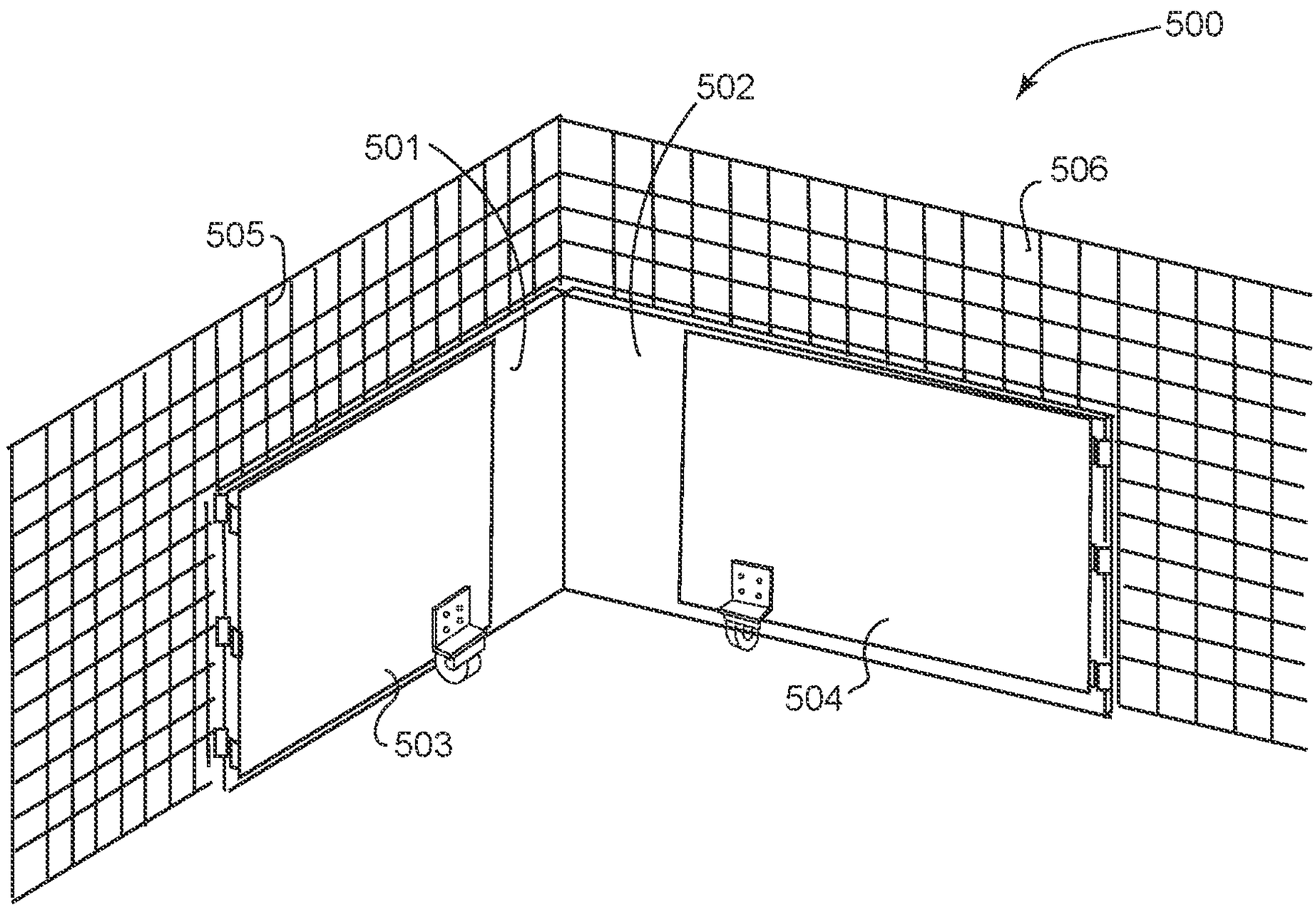

500
502
501
506
505
504
503

Fig. 5b

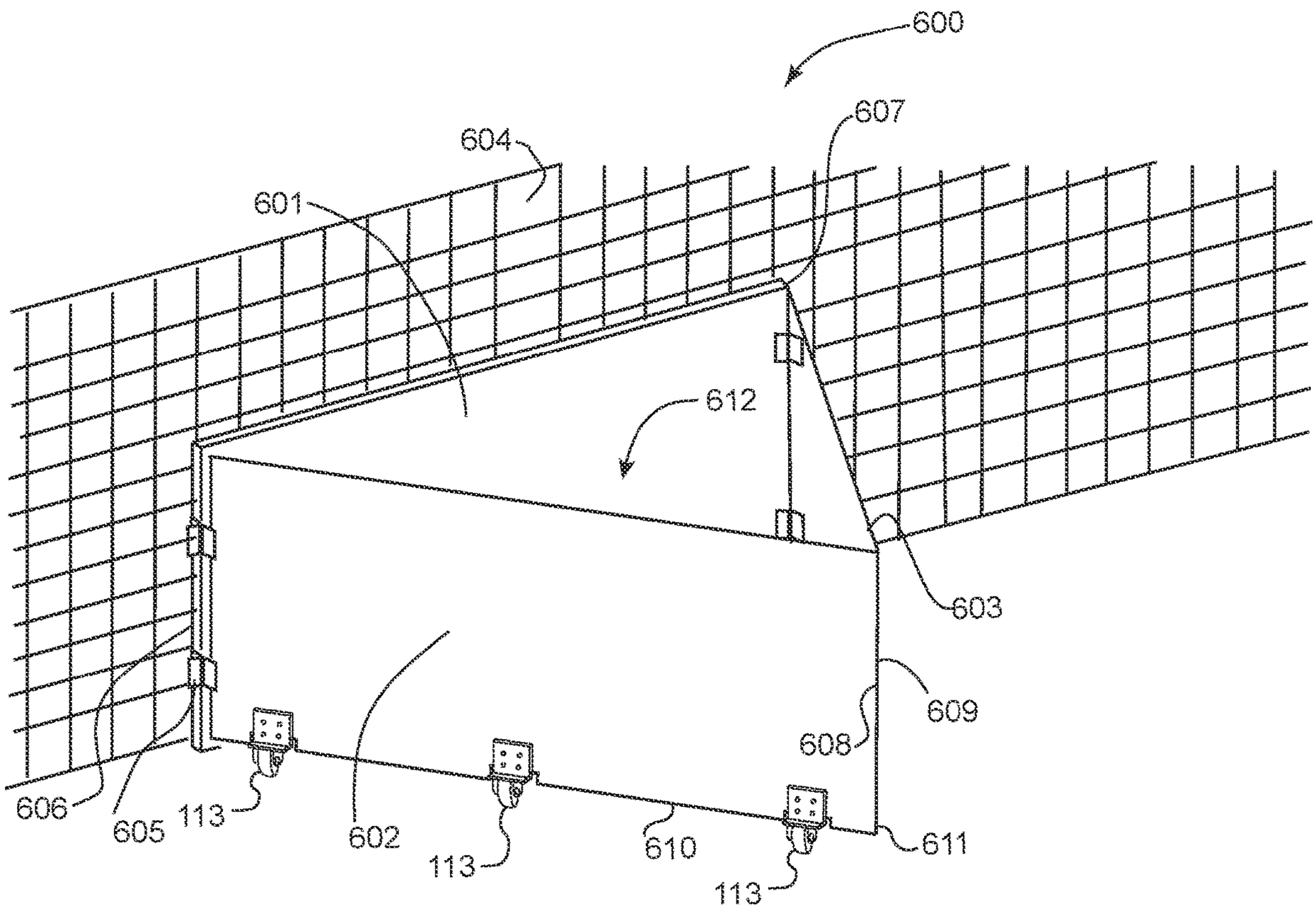


Fig. 6a

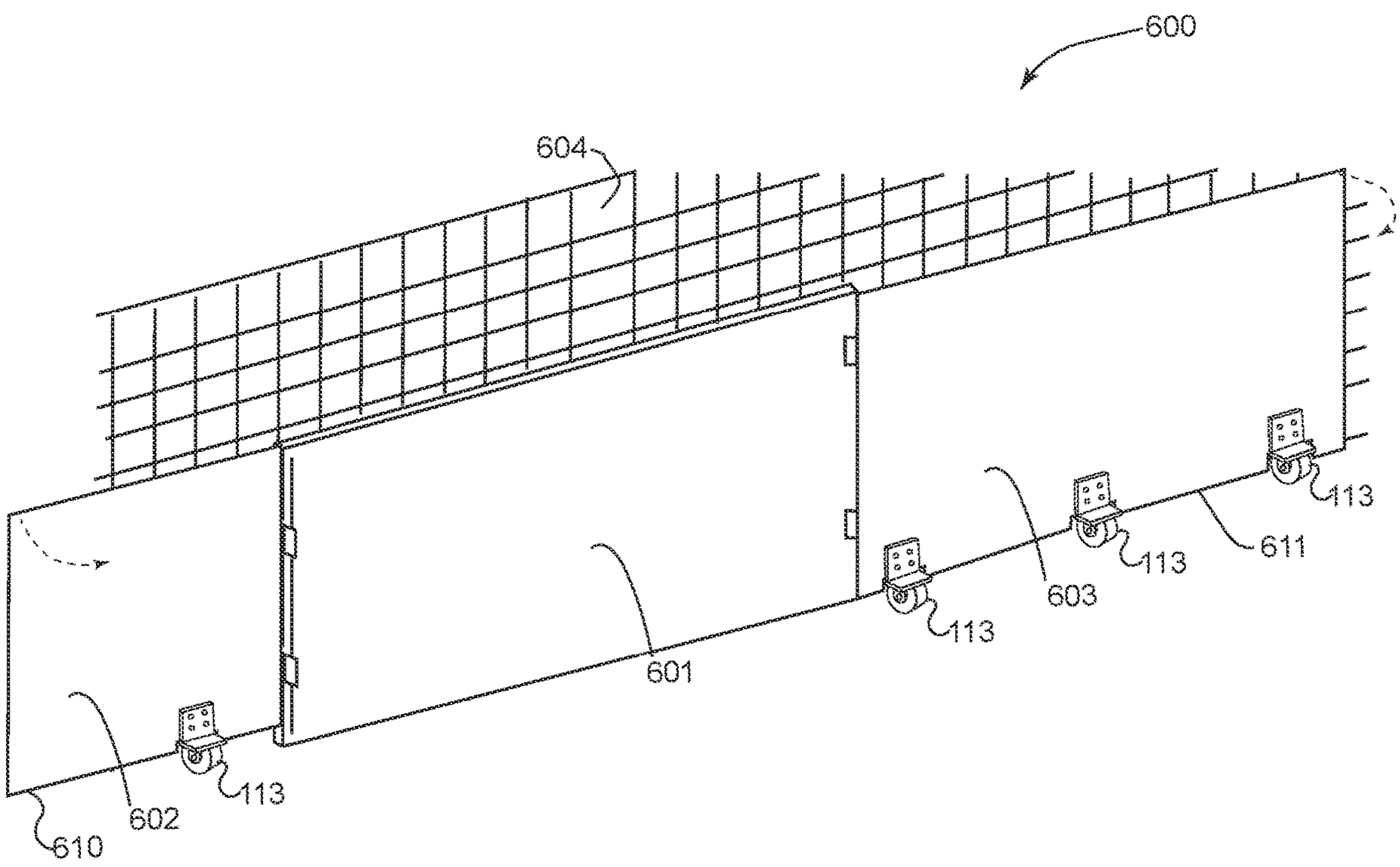


Fig. 6b

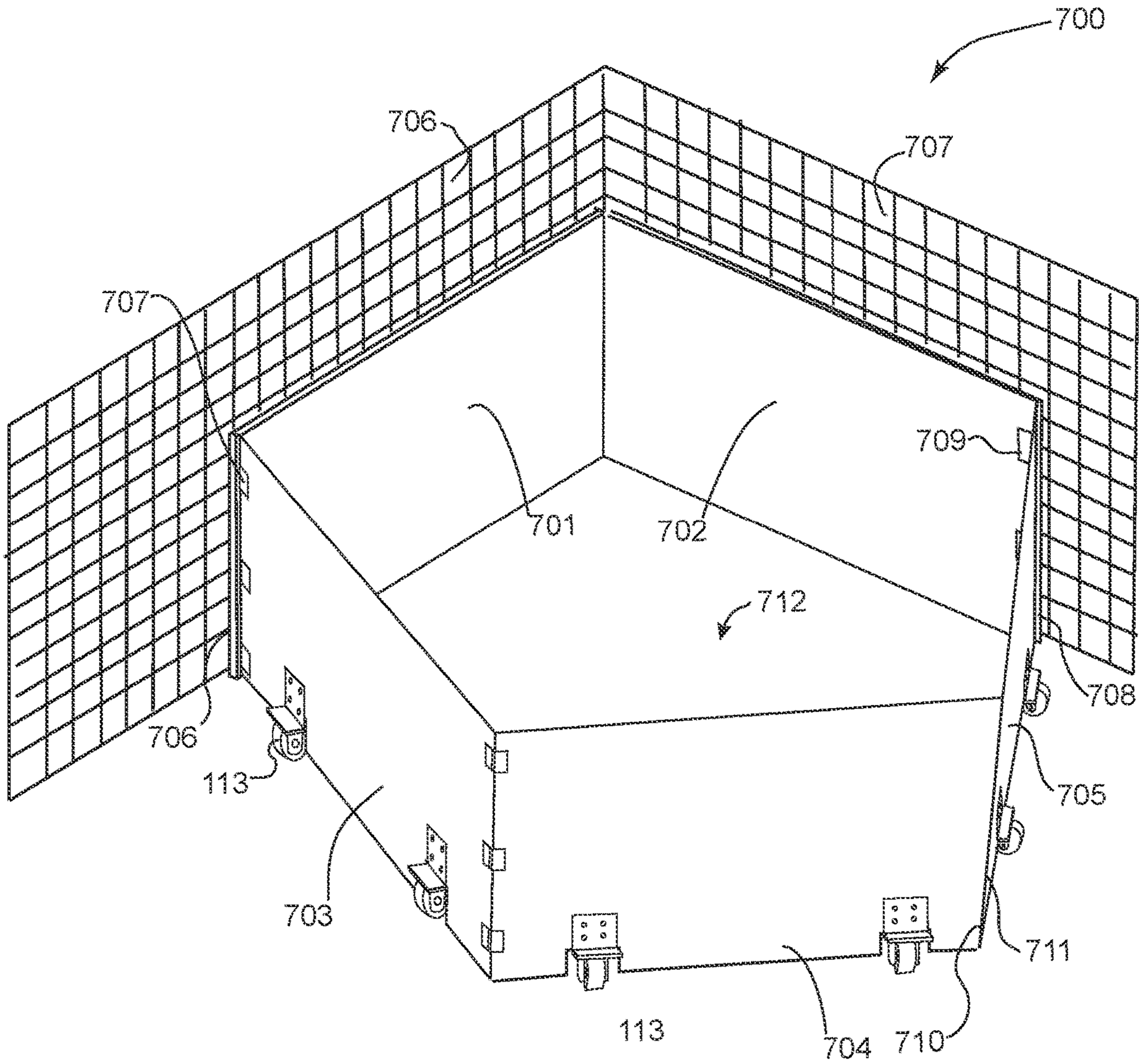

700
706
707
707
701
702
709
712
708
706
113
705
703
711
113
704
710

Fig. 7

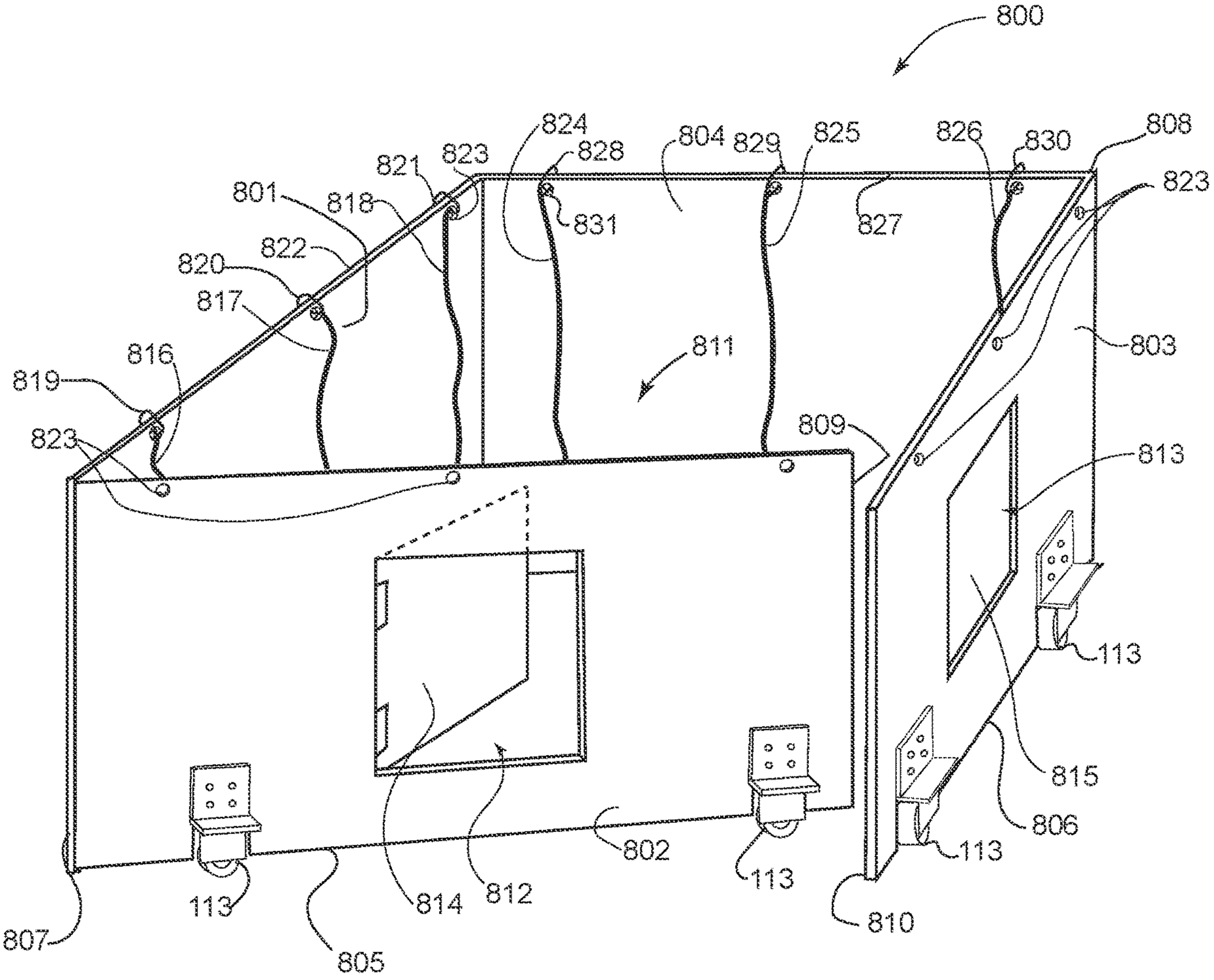

800
824
804
829
825
826
830
808
821
823
828
801
818
831
827
823
822
820
817
811
816
819
803
823
809
813
113
815
806
113
802
113
814
812
113
807
810
805

Fig. 8a

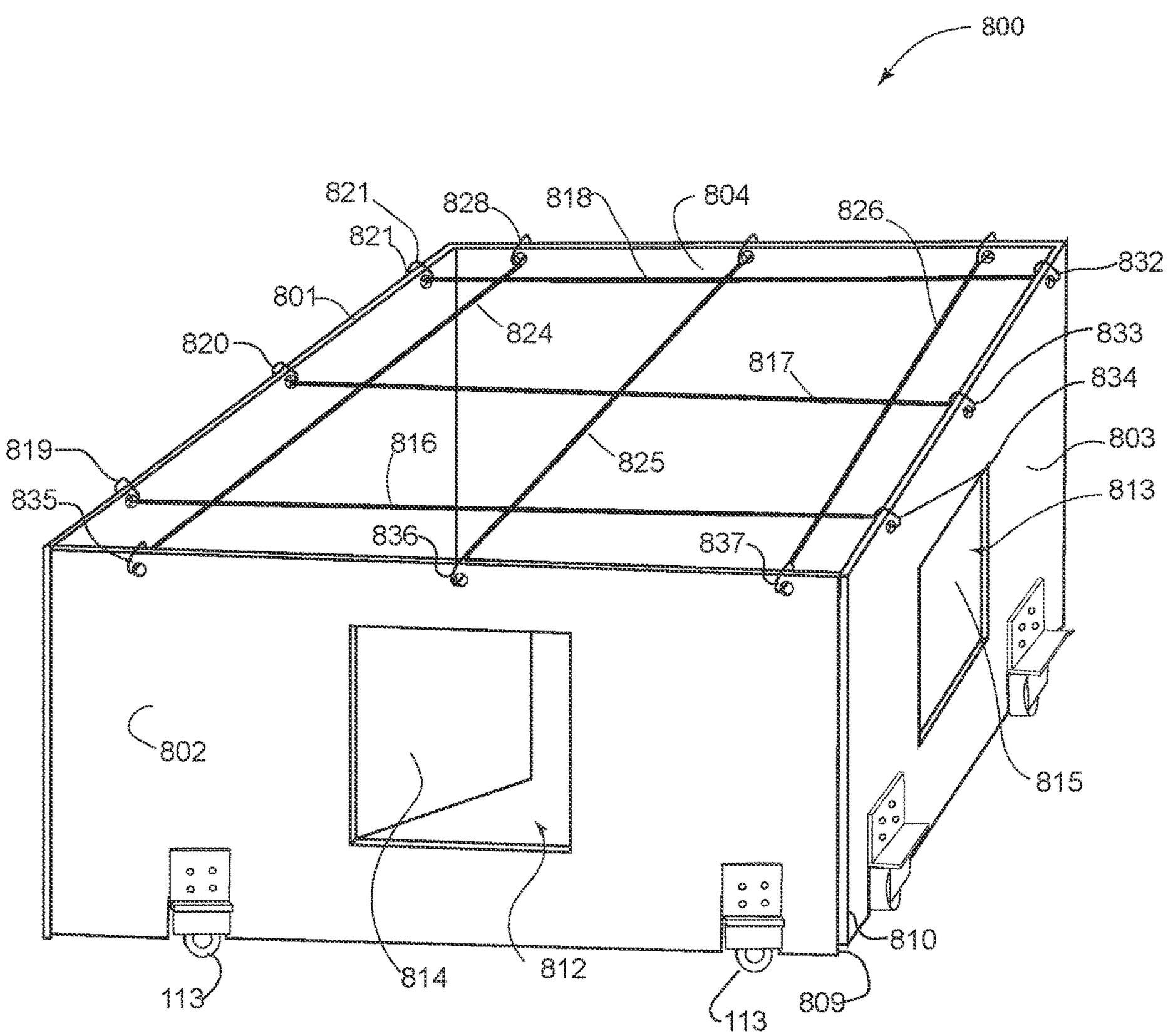

800
821
828
818
804
826
832
821
801
824
820
833
817
834
819
816
825
803
835
813
836
837
802
815
810
814
812
113
809
113

Fig. 8b

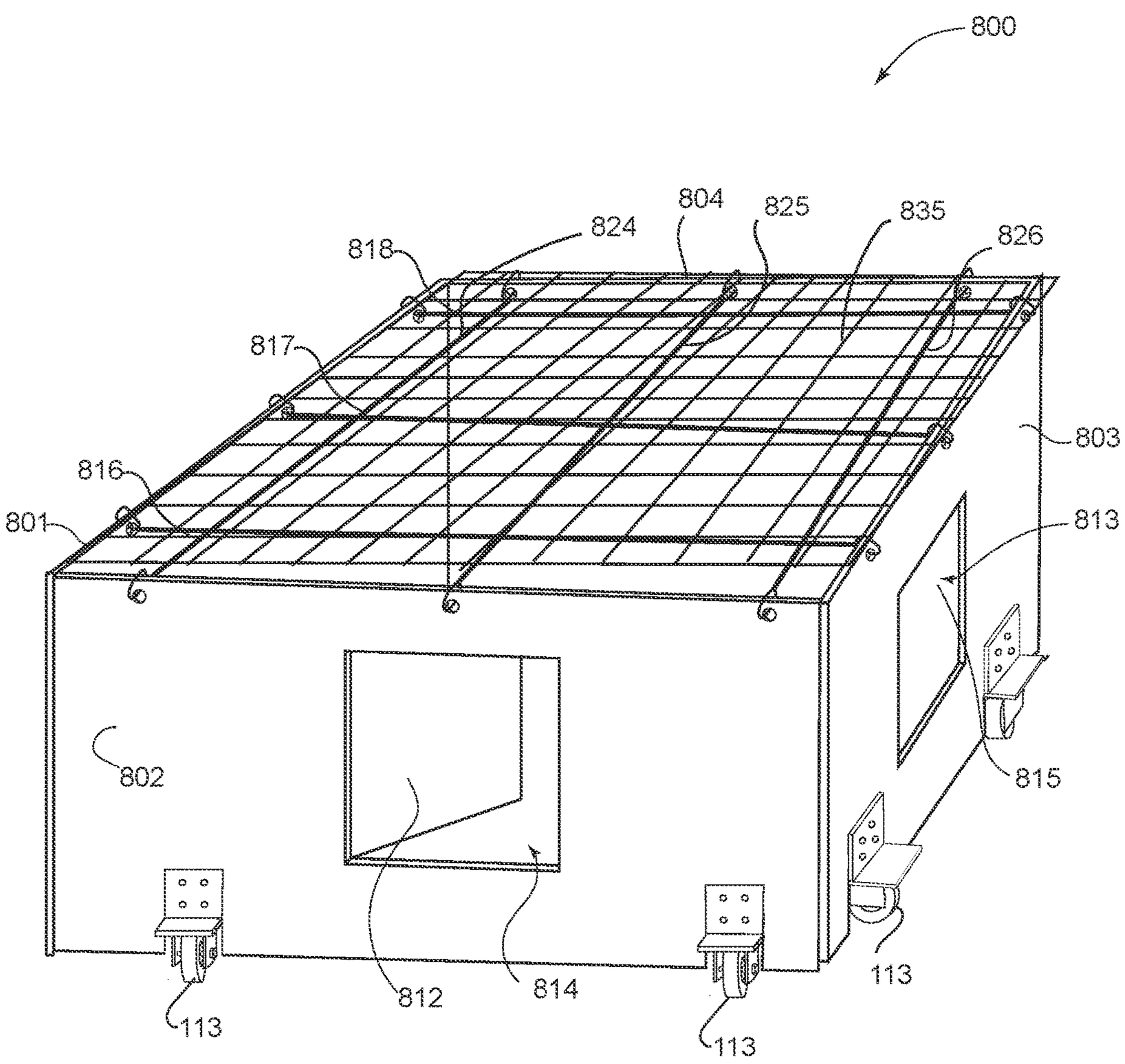

800
824
804
825
835
826
818
817
816
801
803
813
802
815
812
814
113
113
113

Fig. 8c

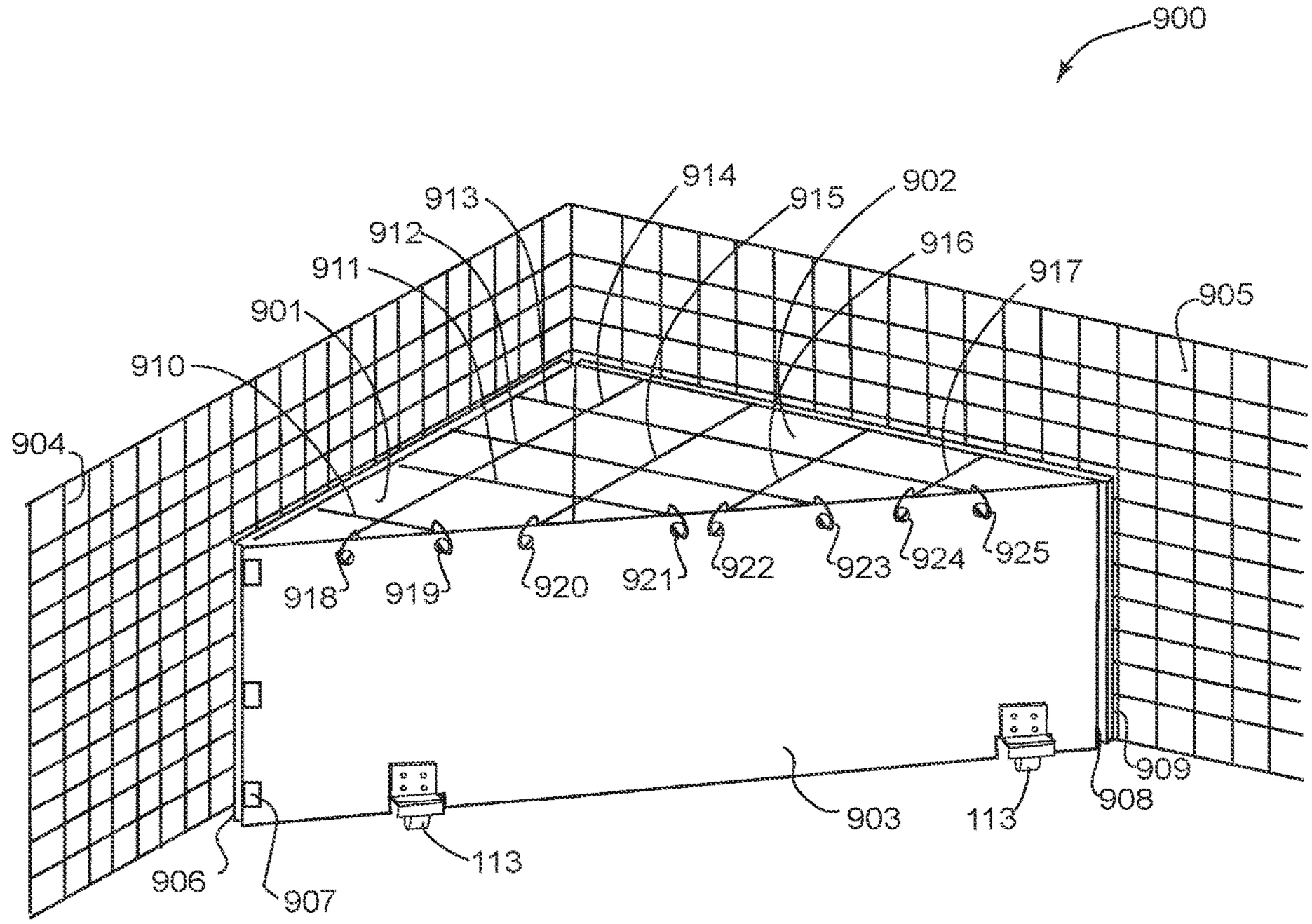

900
914
913
915
902
912
916
911
917
901
905
910
904
918
919
920
921
922
923
924
925
909
903
113
908
113
906
907

Fig. 9

PROTECTIVE ENCLOSURE FOR INTERIOR AND EXTERIOR SPACES

CROSS-REFERENCE TO PRIORITY APPLICATION

This U.S. Patent Applications claims the benefit of U.S. Provisional Application 63/039,450, filed on 15 Jun. 2020.

BACKGROUND

In the event of a natural disaster such as a tornado, hurricane or earthquake, falling and flying debris may injure occupants sequestered or trapped within a classroom, multipurpose room, a room of a domicile, an office or in an outdoor environment. Similarly, when an active shooter threat looms, the fact is that in most building structures today, the interior rooms are all defined by soft walls. This includes wall board or drywall, which are easily penetrated by all small arms fire and other projectiles, putting victims sheltering in those rooms at life risk.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1***a*. Perspective view of an embodiment of a four-sided protective enclosure in a partially deployed configuration and affixed to interior or exterior walls at a corner, according to some embodiments of the disclosure.

FIG. **1***b*. Perspective view of an alternative embodiment of the four-sided protective enclosure shown in FIG. **1***a* in a partially deployed configuration, according to some embodiments of the disclosure.

FIG. **1***c*. Perspective view of a fully deployed configuration of the four-sided protective enclosure shown in FIG. **1***a*, according to some embodiments of the disclosure.

FIG. **1***d*. Perspective view of a stowed configuration of the protective enclosure shown in FIG. **1***a* or **1***c*, according to some embodiments of the disclosure.

FIG. **2**. Perspective view of a stand-alone embodiment of a four-sided protective enclosure where the protective enclosure is detached from interior or exterior walls, according to some embodiments of the disclosure.

FIG. **3***a*. Perspective view of an embodiment of a four-sided protective enclosure in a fully deployed configuration affixed to a single interior or exterior wall, according to some embodiments of the disclosure.

FIG. **3***b*. Perspective view of the four-sided protective enclosure shown in FIG. **3***a* in a stowed configuration, according to some embodiments of the disclosure.

FIG. **4***a*. Perspective view of a three-sided protective enclosure in a fully deployed configuration, affixed to two interior or exterior walls at a corner, according to some embodiments of the disclosure.

FIG. **4***b*. Perspective view of the three-sided protective enclosure embodiment shown in FIG. **4***a*, in a stowed configuration, according to some embodiments of the disclosure.

FIG. **5***a*. Perspective view of an alternative embodiment of a three-sided protective enclosure affixed to two interior or exterior walls at a corner, according to some embodiments of the disclosure.

FIG. **5***b*. Perspective view of the protective enclosure shown in FIG. **5***a* in a stowed configuration, according to some embodiments of the disclosure.

FIG. **6***a*. Perspective view of a second alternative embodiment of a three-sided protective enclosure affixed to a single interior or exterior wall, according to some embodiments of the disclosure.

FIG. **6***b*. Perspective view of the three-sided protective enclosure shown in FIG. **6***a* in a stowed configuration, according to some embodiments of the disclosure.

FIG. **7**. Perspective view of a five-sided protective enclosure affixed to two interior or exterior walls at a corner, according to some embodiments of the disclosure.

FIG. **8***a*. Perspective view of a four-sided protective enclosure comprising a deployable protective ceiling, the four-sided protective enclosure in a semi-deployed configuration, according to some embodiments of the disclosure.

FIG. **8***b*. Perspective view of the four-sided protective enclosure shown in FIG. **8***a* comprising the deployable protective ceiling in a fully deployed configuration, according to some embodiments of the disclosure.

FIG. **8***c*. Perspective view of the four-sided protective enclosure shown in FIG. **8***b* further comprising a secondary netting, according to some embodiments of the disclosure.

FIG. **9**. Perspective view of a three-sided protective enclosure comprising a deployable protective ceiling in a fully deployed configuration, according to some embodiments of the disclosure.

DETAILED DESCRIPTION

Disclosed herein is a deployable protective enclosure for shielding persons occupying an interior or exterior space from falling or flying projectiles and debris caused by a natural disaster such as a tornado, hurricane or an earthquake. The disclosed protective enclosure may further be deployed to shield occupants from bullets fired in an active shooter event. The disclosed protective enclosure may be deployed within an interior space, for example, inside of an office, a multipurpose room or a classroom. Alternatively, the disclosure configurable protective enclosure may be deployed in an exterior environment, such as a playground, a parking lot, or yard.

In some embodiments, the disclosure protective enclosure is attached to at least one interior wall of a room or building, or along an exterior wall. In some embodiments, the protective enclosure is affixed to two intersecting walls, for example at a corner of a room. In other embodiments, the disclosure protective enclosure is a free-standing structure that may be deployed independently of any interior or exterior walls and positioned freely within a room. According to some embodiments, the deployable protective enclosure comprises three or four fixed and articulated partitions, coupled to each other by hinges. For example, the deployable protective enclosure may comprise at least one partition affixed to a permanent wall (e.g., a wall of a room), to which two articulated partitions are attached by hinges on opposing sides of the stationary partition. A fourth articulated partition may be attached to a free edge of one of the partitions that pivot relative to the stationary partition.

The articulated partitions may each be equipped with at least one heavy duty caster allowing them to be quickly moved into position, forming a protective enclosure that provides 360-degree protection by abutting together the free vertical edges of the articulated and fixed partitions. In some embodiments, handles may be included on the articulated partitions to facilitate handling and manipulating the articulated partitions. In other embodiments, means are included for securing the articulated partitions when the protective enclosure is deployed. The latter action may form substantially triangular, rectangular, rhombic or pentagonal protective enclosures, described herein, providing a safe space for victims in the room to shelter. The innovative protective

enclosure is by no means limited to these shapes. Any polygonal shape may be conceived, hexagonal and higher polygonal configurations.

In some embodiments, the deployable protective enclosure comprises two partitions that are affixed to two intersecting permanent walls (e.g., at a corner or a room) and are thus stationary. In some embodiments, a single articulated partition is hinged to one of the two stationary partitions, whereby the free edge of the single articulated partition may be secured to a free edge of one of the two stationary partitions. A protective enclosure having a triangular configuration may be thus formed.

In some embodiments, two articulated partitions are hinged to both of the two stationary partitions that are affixed to two intersecting walls at a corner of a room, whereby the free edges of the two articulated partitions may be secured to each other. A protective enclosure having a quadrangle (e.g., square, rectangle or rhombic) configuration may be thus formed.

In some embodiments, at least one of the partitions of the configurable protective enclosure comprise materials capable of deflecting high-velocity projectiles, such as bullets fired from a high-powered weapon. As an example, the material may be a high-strength, high ductility steel alloy, such as AR 500 steel plate. In some embodiments, suitable materials may comply with National Institute of Justice (NIJ) standards for ballistic materials, described below. Other high-strength, high-impact resistant materials may also be employed.

Wheels or rollers may be attached to the bottoms of the articulated partitions to facilitate deployment of the movable partitions into position when needed. When not deployed, articulated partitions may be stowed by folding against each other and/or the one or two stationary partitions.

In some embodiments, a deployable ceiling comprising high-strength cables attached to one or more of the partitions is provided. The cables may be extended over the top of the disclosed protective enclosure to form a grid, protecting occupants from falling debris. Falling debris may result from a tornado, hurricane or earthquake for example. Falling debris may also result from a man-made disaster, such as a bombing or a war. The deployable ceiling may comprise multiple cables, each cable having one or both ends attached along a top edge of two or more stationary or articulated partitions.

In some embodiments, the deployable ceiling may comprise three or more high-strength (e.g., having a break strength of 3,000 lbs to 10,000 lbs) steel cables that are permanently attached to at least one partition (e.g., stationary or articulated) at one end. The second ends of the three or more steel cables may be attachable to a one or more partitions facing the first partition.

In some embodiments, one or more of the partitions may comprise a hatch that is provided to permit entrance or exit from the disclosed protective enclosure when fully deployed, while maintaining closure of the articulated partitions.

In this disclosure, it is understood that the terms "over", "under", "above", "below", "upper", "lower", "top" and "bottom" have the usual structural meanings, referring to relative vertical positions within structural embodiments and to their immediate environment as viewed within the associated figures. Similarly, the terms "left", "right", "side" and "sideways" have the usual structural meanings, referring to relative horizontal positions within structural embodiments and within their immediate environment as viewed within the associated figures.

The terms "substantial" or "substantially" are used within this disclosure to mean "the greater part of", "mostly" or "mostly to fully". For example, "substantially" may qualitatively indicate a measure within 10% of a quantifiable attribute, with the possibility that the measure may range from 90% to 100% of the quantifiable attribute.

All views illustrating the described embodiments of the protective enclosure provided by the figures described by this disclosure are three-dimensional perspective views to show all or most features of the embodiments described within a single view.

FIG. **1***a* shows a perspective-view of protective enclosure **100**, comprising partitions **101**, **102** **103** and **104**. In some embodiments, partitions **101** and **102** are attached to intersecting walls **105** and **106**. Walls **105** and **106** may be interior or exterior intersecting walls, for example at an interior corner of a room, as shown in the illustrated embodiment. Walls **105** and **106** may also be situated on the exterior or outside of a building. Partitions **101** and **102** may be immobile by being affixed to walls **105** and **106**, whereby they are not free to move or pivot. In some embodiments, fixed partitions **101** and **102** is attached to walls **105** and **106** by suitable fasteners. Partitions **103** and **104** have an articulated joint with partitions **101** and **102**, whereby each may respectively pivot at vertical edges **107** and **108** of fixed partitions **101** and **102**, respectively, to open or close protective enclosure **100**.

In the illustrated embodiment, protective enclosure **100** is shown in a partially closed configuration, whereby partition **103** articulates from vertical edge **107** of fixed partition **101** and is substantially parallel to fixed partition **102** in a deployed state. Partition **104** articulates from vertical edge **108** of fixed partition **101** and is shown to be in a semi-deployed state, whereby vertical edge **109** of partition **103** not adjacent to nor joined with vertical edge **110** of partition **104**. Protective enclosure **100** may be closed when vertical edges **109** and **110** are substantially adjacent to one another, as indicated by the dashed arrow, forming a closed polygon (e.g., a four-sided structure such as a square, rectangle, rhombus or other parallelogram) surrounding interior space **111**. A latching or locking mechanism (described below) may be present to secure partitions **103** and **104** in place.

In some embodiments, articulating partitions **105** and **106** are joined to fixed partitions **101** and **102** by hinges **112**. In some embodiments, articulating partitions **103** and **104** may each be supported by one or more casters **113** along bottom horizontal edges **114** and **115** or articulated partitions **103** and **104**, respectively. Casters **113** may facilitate movement of articulated partitions **103** and **104** for positioning them into a closed (e.g. for protective deployment) or an open configuration (e.g., for stowage). Casters **113**, details of which are described below, may be wheels, as shown in the illustrated embodiment, or ball rollers. While two casters are shown for each of articulated partitions **103** and **104**, any suitable number of casters may be employed. For example, three casters distributed along a bottom horizontal edge of articulated partitions are shown in FIGS. **6***a* and **6***b*.

In a protective deployment, occupants may gather within interior space **111** and be protected from lateral projectiles within a room (e.g., within walls **105** and **106**) by partitions **103** and **104**. Fixed partitions **101** and **102** may protect occupants from any laterally flying or ballistic projectiles (e.g., bullets) that may penetrate through walls **105** and **106**.

In some embodiments, partitions **101-104** each comprising materials, such as, but by no means limited to, bullet-proof (e.g., "ballistic") materials capable of deflecting high-speed projectiles such as bullets fired by high-powered

weapons. In some embodiments, materials included within this disclosure may comply with ballistic ratings by the National Institute of Justice (NIJ). For example, suitable materials may comply with any of NIJ Level IIa, Level II, Level Ma, Level III, Level IV ballistic material ratings for impact resistance. NIJ levels describe a material's ability to stop a specified round at a specified velocity, whereby Level IV has the highest rating.

In some embodiments, one or more of partitions **101-104** are compliant with any of NIJ ratings between Level IIa, Level II, Level Ma, Level III, Level IV. As an example, one or more of partitions **101-104** may comprise AR 500 alloy steel plate, having a NIJ Level III or NIJ Level IV rating. The AR500 steel plate may have a thickness between 0.25 inches and 1 inch, corresponding to NIJ Level III or IV ballistic impact standards. In other embodiments, one or more of partitions **101-104** may comprise but are not limited to NIJ Level IIa or greater ballistic fiberglass composite, NIJ level IIa or greater ballistic silicon carbide plate, NIJ level IIa or greater ultra-high molecular weight polyethylene (UHMWPE) (e.g., Dyneema) plate, Kevlar and similar materials, and NIJ level IIa or greater ballistic ceramic/polyethylene composite. Other suitable high-strength or high-impact materials may be employed.

Partitions **101-104** may also have suitable height and length dimensions to meet capacity requirements. For example, protective enclosure **100** may be a four-walled enclosure as shown, dimensioned to accommodate 10-20 occupants. To adequately shelter 10 occupants, partitions **101-104** may have dimensions of 4 feet tall and 8 feet long, each having a thickness of 0.25 inch to 0.5 inch. The weight of articulated partitions **103** and **104** may be a factor determining the choice of partition thickness. For example, a 0.25 inch thick×48 inch×96 inch plate of AR100 steel (e.g., having a density of approximately 0.28 lbs/in^3), may weigh approximately 323 pounds (147 kg). Multiple casters **113** deployed on each articulated partition may support such weight, and readily facilitate the manipulation of articulated partitions **103** and **104** by children, for example.

FIG. **1***b* shows an alternate embodiment of protective enclosure **100**, where partition **104** has an articulated joint with partition **103** between vertical edges **109** and **110**. Partition **103** has an articulated joint with fixed partition **101** as shown in FIG. **1***a*. During deployment, partition **104** may be pivoted into a desired position in succession with partition **103**, where partition **103** may be pivoted into position first, followed by partition **104**. Closure of protective enclosure **100** may be performed by pivoting articulated partition **103** into interior space **111**, juxtaposing vertical edge **130** of articulated partition **104** adjacent to or against vertical edge **108** of fixed partition **102** (e.g., following the arc indicated by the dashed arrow).

In FIG. **1***c*, the embodiment of protective enclosure **100** shown in FIG. **1***a* is shown in perspective view in a fully-closed protective configuration. In the illustrated example, articulated partition **104** has been pivoted to join vertical edge **110** to vertical edge **109** of articulated partition **103**. In some embodiments, a securing means, such as a latch or other suitable locking mechanism that is installed on the interior sides of articulated partitions **103** and **104** (not shown) at vertical edges **109** and **110** may employed to secure articulated partitions **103** and **104** in place. In some embodiments, articulated partitions **103** and **104** may be secured in place by a drop bolt or cane bolt, as employed for securing gates. In the closed configuration, partitions **104** may be substantially parallel to fixed partition **101**, and substantially orthogonal to partitions **102** and **103**. Likewise, partition **103** may be substantially orthogonal to partitions **101** and **104**. In the fully deployed configuration, partitions **101-104** may form the perimeter of a four-sided polygon surrounding interior space **111**, such as a square (as shown), rectangle or rhombus (e.g., a diamond shape).

Exemplary mounting details of caster **113** are illustrated in the inset of FIG. **1***c*. Caster **113** is shown as a wheel and may also be a ball roller as noted above. Caster **113** is affixed to struts **116**, for example by an axle (not shown). Struts **116** may be welded to flange **117** that is integral with mounting plate **118**. Mounting plate **118** may comprise hardened steel alloy such as AR500. Mounting plate **118** may be affixed to articulated partitions **103** and **104** with bolts **119** as shown. In some embodiments, notch **120** is recessed from a bottom edge **114** of partition **103** and **104**. Caster **113** may be nestled within notch **113**, providing a clearance h between bottom horizontal edge **114** and floor **121**. Clearance h may range between 0.5 inches to several inches. For example, clearance h may be 2 inches.

As will be described below and shown in FIGS. **8***a*-**8***c*, a deployable protective ceiling may optionally be included in the embodiments of protective enclosure **100** and further embodiments described below, whereby the deployable protective ceiling may comprise multiple high-strength steel cables deployed in a grid configuration.

In FIG. **1***d*, protective enclosure **100** is in a stowed position. Both articulated partitions **103** and **104** folded against fixed partitions **101** and **102** in a stowed position. In this configuration, protective enclosure **100** may not encumber the surrounding space within room **122**, such as classroom or office. In some embodiments, articulated partitions **103** and **104** may be secured against the walls **105** and **106**, to which partitions **101** and **102** are affixed. By way of example, eyebolts (described below) may be used.

In FIG. **2**, the embodiment of protective enclosure **200** is a stand-alone enclosure comprising articulated partitions **201**,**202**, **203** and **204**. Protective enclosure **200** is shown detached from room walls **103** and **104** and spaced therefrom by a distance d, where each of partitions **201-204** comprise at least two casters **113** for facilitating mobility. Protective enclosure **200** may be positioned against room walls **103** and/or **104** if desired for enhanced protection.

FIG. **3***a* illustrates an alternative embodiment of protective enclosure **300** attached to a single wall **301**. Protective enclosure **300** may be substantially at a mid-wall distance from a corner, according to some embodiments. In FIG. **3***a*, protective enclosure **300** is installed along wall **301**, substantially away from a corner, according to some embodiments. In this mid-wall embodiment as illustrated in FIG. **3***a*, a single fixed partition **302** is affixed to wall **301**

Protective enclosure **300** comprises fixed partition **302** affixed to room wall **301**, and articulated partitions **303**, **304**, and **305** may be daisy-chained together from fixed partition **302**, as shown in the illustrated embodiment, or have articulated partitions attached to opposing vertical edges of fixed partition **302**. The three articulating partitions **303**, **304** and **305** may articulate with each other in such a way that one articulated partition (e.g., partition **303**) articulates with fixed partition **302**. In the illustrated embodiment, protective enclosure **300** comprises a wrap-around configuration comprising partitions **302-305**. As shown in FIG. **3***a*, articulated partition **303** is attached to one edge **306** (e.g., the left edge) of fixed partition **302** by hinges **307**. Articulated partition **305** may articulate from edge **308** (e.g., left edge) of fixed partition **302** or pivot from edge **309** of articulated partition **304**. In the illustrated embodiment, articulated partition **305** is attached to edge **309** of partition **304** by hinges **310**.

Although not shown, it is understood that a means to secure partitions **303-305** in place may be employed, as described above.

In alternative embodiments, partition **305** may be attached to vertical edge **308** of fixed partition **302**, followed by partition **304** attached to vertical edge **309** by hinges **310**. Partition **304** may close against **303**. A latching means may be employed to secure partition **304** to partition **303**. Interior space **311** surrounded by partitions **302-305** may accommodate multiple occupants. Partitions **301-304** form the perimeter of a four-sided polygon, such as a square as shown. Other quadrangular shapes may be also assumed depending on the relative lengths of partitions **301-304**, such as a rectangle, rhombus or other parallelogram.

Partitions **302-305** may comprise steel plates and other materials substantially as described above. For example, partitions **302-305** may have overall dimensions of 4 feet×8 feet. In some embodiments, AR500 steel plate having a thickness of 0.25 inch to 0.5 inch may be employed. For example, fixed partition **302** may comprise AR500 plate having a thickness of 0.5 inch, whereas mobile partitions **303-305** may comprise AR500 plate having a thickness of 0.25 to 0.375 inch. Other materials and dimensions may be employed by any or all of partitions **302-305**.

FIG. **3***b* illustrates protective enclosure **300** in a stowed configuration. In the illustrated embodiment, articulated partitions **303-305** are folded together into a horizontal stack in a manner following the order of attachment, (e.g., articulated partition **305** folded against articulated partition **304**, and against partition **303**), and may be stacked against fixed partition **302**. In an alternate embodiment described above, articulated partition **305** may pivot from the right vertical edge (e.g., vertical edge **308**) of fixed partition **302**, while partition **303** may pivot from the left edge (e.g., vertical edge **306**) of fixed partition **302**. Articulated partition **304** may be folded against partition **305** for stowage, and then pivoted against fixed partition **302**. Articulated partition **303** may also be folded down over stowed partitions **304** and **305**.

FIG. **4***a* illustrates three-sided protective enclosure **400**, comprising fixed partitions **401** and **402** and a single articulating partition **403**. Fixed partitions **401** and **402** may be affixed to intersecting walls **404** and **405**, for example at the corner of an office or classroom. Articulated partition **403** may articulate from vertical edge **406** of fixed partition **401** or from vertical edge **407** of fixed partition **402**, however is shown to have an articulated joint with fixed partition **401** at vertical edge **407**, having the ability to swing outward, as indicated by the dashed arrow in the figure. Hinges **408** may be employed to hang articulated partition **403** from fixed partition **401**, whereas casters **113** may facilitate manipulation of articulated partition **403**. It will be understood that although not shown, a means to secure articulated partition **403** in a closed position may be present, as described above. In the fully deployed state, partitions **401-403** form the perimeter of a triangular polygon.

FIG. **4***b* illustrates protective enclosure **400** in an exemplary stowed configuration. Articulated partition **403** may be swung to an open position, being against wall **404**, for example. Alternatively, partitions **405** and **406** may be opened to stack against room walls **403** and **404** (not shown) when stowed

FIG. **5***a* shows alternative triangular protective enclosure **500**. While a three-sided enclosure, protective enclosure **500** comprises fixed partitions **501** and **502** and two articulated partitions **503** and **504**. Fixed partitions are affixed to intersecting walls **505** and **506**. Walls **505** and **506** may be at a corner of a room, for example. Articulated partitions **503** and **504** may each have a horizontal dimension that is approximately half the distance from edge **507** of fixed partition **501** to edge **508** of fixed partition **502**. When in a closed position, as shown, articulated partitions **503** and **504** may jointly span the distance between edges **507** and **508**, enclosing interior space **509** by three sides. As noted above, partitions **501-503** may form the perimeter of a triangular polygon when protective enclosure **500** is fully deployed.

Partitions **501-504** may comprise materials substantially as described above for earlier-described embodiments. For example, partitions **501-504** may comprise 0.25 inch to 0.5 inch thick AR500 steel plate. In some embodiments, articulated partitions **501** and **502** may comprise casters **113** attached to bottom horizontal edges **510** and **511**, respectively. In some embodiments, casters **113** may be substantially as described above. It may also be understood that although not shown, a latching means may be present to secure articulated partitions **503** and **504** into a closed position. In some embodiments, protective enclosure **500** may comprise a single articulated partition, as shown in FIG. **9**.

FIG. **5***b* shows protective enclosure **500** in an exemplary stowed position. In the illustrated embodiment, articulated partitions **503** and **504** are folded against fixed partitions **501** and **502**. Alternatively, articulated partitions **503** and **504** may be stowed against walls **505** and **506**, respectively.

FIG. **6***a* shows an alternative three-sided protective enclosure **600** in a mid-wall configuration, having a single fixed partition **601** and two articulated partitions **602** and **603**. Fixed partition **601** may be affixed to single wall **604** within an interior of a room, or in an outdoor deployment. Articulated partitions **602** and **603** may articulate via hinges **605** from vertical edges **606** and **607** of fixed partition **601**, respectively, and close at far vertical edges **608** and **609** of articulated partitions **602** and **603**, respectively. One or more casters **113** may be along bottom horizontal edges **610** and **611** of each of articulated partitions **602** and **603** to facilitate deployment of articulated partitions **602** and **603** to a closed three-sided (e.g., triangular) structure surrounding interior space **612**.

FIG. **6***b* illustrates protective enclosure **600** in an exemplary stowed configuration. Both articulated partitions **602** and **603** are opened flat against wall **604**, fully exposing fixed partition **601**. In alternative embodiments, at least one of articulated partitions **602** and **603** may be folded against fixed partition **601**. The dashed arrows show that articulated partitions **602** and **603** may be swung into the closed triangular configuration shown in FIG. **6***a*.

FIG. **7** illustrates protective enclosure **700**, having five sides forming a pentagonal structure as shown, comprising fixed partitions **701** and **702**, coupled to articulated partitions **703**, **704** and **705**. In the illustrated embodiment, articulated partition **703** articulates from vertical edge **706** of fixed partition **701** by virtue of hinges **707**, whereas articulated partition **705** articulates from vertical edge **708** of fixed partition **702** by virtue of hinges **709**. Vertical edges **710** and **711** of articulated partitions **704** and **705**, respectively, may be brought into adjacency for closure of protective enclosure **700**, surrounding interior space **712** on five sides. In alternate embodiments, articulated partition **705** may articulate from vertical edge **710** of articulated partition **704**.

FIG. **8***a* illustrates protective enclosure **800**, having a deployable protective ceiling comprising a grid of high-strength cables to protect occupants from falling objects and debris. In the illustrated embodiment, protective enclosure **800** is a four-sided structure comprising partitions **801**, **802**, **803** and **804**. In some embodiments, protective enclosure

800 is a three-sided or five-sided structure, similar to protective enclosures **600** or **700**, respectively, for example. In some embodiments, partitions **801** and/or **804** may be fixed partitions. For example, partitions **801** and **804** may be affixed to one wall or two intersecting walls. In some embodiments, partition **801** and **804** are free standing and articulated structures, similar to partitions **201** and **202** shown in FIG. **2**.

Partitions **801-804** may comprise materials having sufficient strength to deflect flying and ballistic objects, such as bullets or high velocity flying debris launched by an explosion or hurled into the air by a tornado or hurricane. In some embodiments, partitions **801-804** comprise materials compliant with NIJ Level II through Level IV specifications described above. An example is AR500 steel plate having a minimum thickness of 0.25 inch, for example, compliant with a NIJ Level III rating. However, other materials that have been listed above and other suitable materials not listed may be employed. Partitions **801-804** may have suitable dimensions that afford maximal protection to occupants from laterally flying or ballistic projectiles. For example, any or all of partitions **801-804** may have dimensions of 4 feet tall by 8 feet wide, affording protection for up to 10 adult occupants, and a thickness ranging from 0.25 inch to 0.5 inch.

Casters **113**, described in detail above, are shown attached near the bottom horizontal edges **805** and **806** of partitions **802** and **803**, respectively, may facilitate manipulation of partitions **801-804**, for example to swing articulated partitions (e.g., partitions **802** and **803**) into a deployed (e.g., closed) state. As noted above, casters **113** may have a fixed orientation or swivel to follow a desired arc of articulated partitions (e.g., partitions **802** and **803**) when handled.

Partitions **802** and **803** may be articulated partitions. In some embodiments, partition **802** articulates with partition **801** at vertical edge **807**, whereas partition **803** articulates from vertical edge **808** of partition **804**, as shown. In some embodiments, vertical edge **809** of partition **803** articulates from vertical edge **810** of partition **802** (not shown).

Protective enclosure **800** may be closed by swinging one or both of partitions **802** and **803** to bring vertical edges **809** and **810** into adjacency and securing partitions **802** and **803** in place by a securing means (not shown) as described above. Interior space **811** may be enclosed on four sides, configured as a square, rectangle, rhombus or other parallelogram, depending on the relative lengths of partitions **801-804**, which may have any suitable dimensions.

In the illustrated embodiment, articulated partitions **802** and **803** optionally comprise hatches **812** and **813**, respectively. In the illustrated example, hatches **812** and **813** are approximately within the center portions of partitions **802** and **803**. In alternate embodiments, hatches **812** and **813** may be at any suitable location within partitions **802** and **803**, including to the right side or left side of any of partitions **801-804**. While the illustrated embodiment only shows partitions **802** and **803** comprising hatches, it will be understood that partitions **801** and **804** may also comprise similar hatches. Hatches **812** and **813** may be employed as emergency entrances and/or exits once partitions **802** and **803** are deployed. Hatches **812** and **813** may be accompanied by hatch doors **814** and **815**, respectively, for closing hatches **812** and **813**.

As noted, hatches **812** and **813** may be employed for entrance and exit by occupants during an emergency. For example, partitions **802** and **803** may first be deployed from a stowed state (not shown), and hatches **812** and **813** opened to allow children in a classroom and/or adults in a classroom, office or other space where a group may be gathered to enter protective enclosure **800**. Hatch doors **814** and **815** may be shut against hatches **812** and/or **813** for fully enclosing any occupants within protective enclosure **800**.

Protective enclosure **800** may optionally comprise a deployable protective ceiling comprising high-strength steel cables arranged as a cargo netting, for example. In the illustrated embodiment, cables **816**, **817** and **818** are shown to have one end secured to partition **801**. While three cables are shown to be attached to partition **801** in the illustrated embodiment, any suitable number of cables may be employed. In the illustrated embodiment, hooks **819**, **820** and **821** may be employed as receiving structures to secure cables **816-818** to upper horizontal edge **822** of partition **801** through holes **823**. Likewise, cables **824**, **825** and **826** may be secured at one end to top horizontal edge **827** of partition **804** by receiving structures. As an example, hooks **828**, **829** and **830**, secured to partition **804** by threading through holes **831**, may be respectively employed to hang cables **824-826** from top horizontal edge **827**. While hooks are included in the illustrated embodiment, it is understood that any suitable means of attachment of cables to any partition may be employed. While three cables are shown attached to partition **804** in the illustrated embodiment, it is understood that any suitable number of cables may be employed.

Cables **816-818** and **824-826** may have a suitable strength to deflect heavy falling objects, for example weighing 3000 pounds or more. In some embodiments, cables **816-818** and **824-826** comprise high-strength steel, for example, capable of break strengths of 5000 to 10,000 pounds. In some embodiments, other non-elastic rope materials may be employed, for example non-metal materials comprising, for example, Dyneema or Kevlar, may be employed, capable of similar properties and strength held by some steel alloys suitable for cable. For example, cables **816-818** and **824-826** may be rated to a break strength of 3000 to 10,000 pounds. While in the illustrated embodiment, cables **816-818** and **824-826** shown hanging downwardly in an un-deployed state, other storage configurations may be employed when cables **816-818** and **824-826** are not in use.

FIG. **8***b* shows cables **816-818** and **824-826** in a deployed state, whereby cables **816-818** and **824-826** are extended between partitions **801** and **803**, and **802** and **804**, respectively. In a deployed state, cables **816-818** and **824-826** are stretched over the top of protective enclosure **800** in a grid formation, as shown. As shown in the illustrated embodiment, articulated partitions **802** and **803** are fully deployed, whereby vertical edge **809** of partition **802** and vertical edge **810** of partition **803** are adjacent. A latching means as described above (not shown) may be employed to secure and/or immobilize partitions **802** and **803**. Cables **816-818** and **824-826** are attached to opposing partitions (e.g., stretching cables **816-818** between partition **801** and partition **803**). Cables **816-818** are extended between partitions **801** and **803** and may be similarly secured at their opposite ends to partition **803** by receiving structures such as hooks **832**, **833** and **834**, respectively. Cables **824-826** are similarly deployed, secured to partition **802** at opposing ends by hooks substantially orthogonal to cables **816-818**. As a result, a protective ceiling may be provided by deploying cables **816-818** and **824-826** in an orthogonal or non-orthogonal grid or mesh pattern. Cables **816-818** and **824-826** may be deployed to deflect large falling or flying debris from striking occupants, for example in a tornado, hurricane or earthquake.

In FIG. **8***c*, protective enclosure **800** may optionally comprise secondary netting **835**, shown in a deployed state,

extended over the top of protective enclosure **800** as part of a deployable protective ceiling extending in one direction between partitions **801** and **803**, and in an orthogonal direction between partitions **802** and **804**. Netting **835** may have a smaller mesh than that provided by cables **816-818** and **824-826**, providing an enhanced protective mesh against falling objects that are smaller than the mesh size provided by cables **816-818** and **824-826**. Netting **835** may supplement cables **816-818** and **824-826** to deflect falling debris that may be smaller than the spacing between cables **816-818** and **824-826**. In some embodiments, netting **835** may comprises steel cable substantially similar to steel cable described for cables **816-818** and **824-826**. In alternate embodiments, netting **835** comprises non-metallic materials, such as, but not limited to, Dyneema or Kevlar, as described above. Netting **835** may be unfurled over extended cables **816-818** and **824-826** and secured to partitions **801-804** by separate hooks or other suitable means (not shown). Effective protection against a variety of threats to occupants of classrooms offices and other interior spaces may be extended by netting **835**.

In FIG. **9**, protective enclosure **900** is a three-sided enclosure that is substantially similar to protective enclosure **400** illustrated in FIGS. **4***a* and **4***b*. Protective enclosure **900** comprises a deployable protective ceiling similar to that described for four-sided protective enclosure **800**. Protective enclosure **900** comprises partitions **901**, **902** and **903**. Partitions **901** and **902** are fixed partitions and may be affixed to intersecting walls **904** and **905** as shown. Partition **903** is an articulated partition that may articulate from vertical edge **906** of fixed partition **901** by virtue of hinges **907**. Casters **113**, described above, may support articulated partition **903** and facilitate its handling and deployment or stowage. As illustrated in FIG. **9**, protective enclosure **900** is in a fully deployed state, whereby vertical edge **908** of articulated partition **903** is adjacent to vertical edge **909** of fixed partition **902**. As noted above, a latching or other means (not shown) may be present to secure articulated partition **903**. Partitions **901-903** may comprise suitable dimensions and materials as have been described above.

Protective enclosure **900** further comprises cables **910**, **911**, **912** and **913** extending from fixed partition **901** to articulated partition **903**. Likewise, cables **914**, **915**, **916** and **917** extend from fixed partition **902** to articulated partition **903**. As shown in the illustrated embodiment, cables **910-913** may extend substantially orthogonally with respect to cables **914-917**, forming a grid mesh that may afford a protective measure for occupants of protective enclosure **900** against falling objects and debris. Cables **910-917** may be attached at one end to fixed partitions **901** and **902** by similar means (e.g., hooks **832-837** in FIG. **8***b*) as employed for protective enclosure **800**. As shown in the illustrated embodiment of FIG. **9**, cables **910-917** are attached at their opposing ends to articulated partition **903** by hooks **918**, **919**, **920**, **921**, **922**, **923**, **924** and **925**. It is understood that other suitable means to secure cables **910-917** to partitions **901-903** may be employed.

It will be understood by persons skilled in the art that the foregoing embodiments serve as manifestations of the innovation described in this disclosure, and by no means are to be construed as limiting the scope of the innovation. Variations of the disclosed embodiments may be construed as equivalent, and do not depart from the spirit and the scope of the innovation herein described and disclosed.

We claim:

1. A protective enclosure, comprising:

a first partition having a first vertical edge and an opposing second vertical edge;

a second partition adjacent to the first partition, the second partition having a third vertical edge and an opposing fourth vertical edge, wherein the third vertical edge is adjacent to the second vertical edge;

a third partition having a fifth vertical edge and an opposing sixth vertical edge, wherein the fifth vertical edge is adjacent to the first vertical edge, and wherein the fifth vertical edge has an articulated joint with the first vertical edge;

a plurality of cables, wherein ones of the plurality of cables have a first end secured to the first partition, wherein the ones of the plurality of cables are extendable from the first partition to the second partition or to the third partition, and wherein the ones of the plurality of cables have a second end that is securable to the second or to the third partition; and

a netting extending over the plurality of cables, the netting is securable to the first, second and third partitions and has a mesh size that is less than a distance between adjacent ones of the plurality of cables,

wherein:

any of the first partition, the second partition and the third partition comprise a ballistic material; and

the first, second and third partitions are to be configured to form at least a part of a perimeter of a closed polygon having at least three sides surrounding an interior space.

2. The protective enclosure of claim **1**, further comprising a fourth partition between the second partition and the third partition, the fourth partition having a seventh vertical edge and an opposing eighth vertical edge, wherein:

the seventh vertical edge articulates with the sixth vertical edge of the third partition; or

the eighth vertical edge articulates with the fourth vertical edge of the second partition.

3. The protective enclosure of claim **2**, wherein the first, second, third and fourth partitions are to be configured to form a closed polygon surrounding the interior space when the seventh vertical edge of the fourth partition is adjacent to the sixth vertical edge of the third partition and the eighth vertical edge of the fourth partition is adjacent to the fourth vertical edge of the second partition.

4. The protective enclosure of claim **2**, further comprising a fifth partition between the second partition and the fourth partition, the fifth partition having a ninth vertical edge and an opposing tenth vertical edge, wherein:

the ninth vertical edge articulates with the eighth vertical edge; or

the tenth vertical edge articulates with the fourth vertical edge; and

the first, second, third, fourth and fifth partitions are to be configured to form the perimeter of a closed polygon surrounding the interior space when the ninth vertical edge of the fifth partition is adjacent to the eighth vertical edge of the fourth partition and the tenth vertical edge of the fifth partition is adjacent to the fourth vertical edge of the second partition.

5. The protective enclosure of claim **2**, wherein the plurality of cables comprises six or more cables, at least three of the six or more cables each having a first end secured to a first receiving structure on the first partition and a second end securable to a second receiving structure on the third partition, and at least three of the six or more cables

each having a first end affixed to a third receiving structure on the second partition and a second end securable to a fourth receiving structure on the fourth partition.

6. The protective enclosure of claim **5**, wherein the six or more cables have a tensile strength of at least 3000 pounds.

7. The protective enclosure of claim **1**, wherein the ballistic material is any one of AR 500 alloy steel, fiberglass composite, silicon carbide, polyethylene or a composite comprising a ceramic powder in a polyethylene matrix.

8. The protective enclosure of claim **2**, wherein at least a first caster is affixed to a first bottom edge of the third partition, and wherein at least a second caster is affixed to a second bottom edge of the fourth partition.

9. The protective enclosure of claim **1**, wherein at least one of the first partition, second partition and the third partition comprises a hatch.

10. The protective enclosure of claim **1**, further comprising a fourth partition between the second partition and the third partition, wherein the fourth partition has a seventh vertical edge and an opposing eighth vertical edge, wherein:

the fifth vertical edge of the third partition articulates with the first vertical edge of the first partition;

the eighth vertical edge of the fourth partition articulates with the fourth vertical edge of the second partition;

the third partition and the fourth partition each have a length that is substantially one half of the distance between the first vertical edge of the first partition and the fourth vertical edge of the second partition; and

the first, second, third and fourth partitions are to be configured to form a closed polygon surrounding the interior space when the seventh vertical edge of the fourth partition is adjacent to the sixth vertical edge of the third partition.

11. A system, comprising:

an area having a perimeter comprising a first wall and a second wall; and

a protective enclosure within the area, the protective enclosure comprising:

a first partition having a first vertical edge and an opposing second vertical edge;

a second partition adjacent to the first partition, the second partition having a third vertical edge and an opposing fourth vertical edge, wherein the third vertical edge is joined to the second vertical edge;

a third partition having a fifth vertical edge and an opposing sixth vertical edge, wherein the fifth vertical edge is adjacent to the first vertical edge and wherein the fifth vertical edge has an articulated joint with the first vertical edge;

a plurality of cables, wherein ones of the plurality of cables have a first end secured to the first partition, wherein the ones of the plurality of cables are extendable from the first partition to the second partition or to the third partition, and wherein the ones of the plurality of cables have a second end that is securable to the second or to the third partition; and

a netting extending over the plurality of cables, the netting is securable to the first, second and third partitions and has a mesh size that is less than a distance between adjacent ones of the plurality of cables,

wherein:

any of the first partition, the second partition and the third partition comprise a ballistic material;

the first, second and third partitions are to be configured to form at least a part of a perimeter of a closed polygon having at least three sides surrounding an interior space.

12. The system of claim **11**, wherein the area is a room having a perimeter comprising the first wall and the second wall, wherein the first wall and the second wall are interior walls, or wherein the area is an outdoor space having a perimeter comprising the first wall and the second wall, wherein the first wall and the second wall are exterior walls.

13. The system of claim **11**, wherein the first wall has a joint with the second wall, wherein the first partition is affixed to the first wall and the second partition is affixed to the second wall, wherein the second edge of the first partition is adjacent to the third edge of the second partition, and wherein the joint between the first wall and the second wall is between the second edge of the first partition and the third edge of the second partition.

14. The system of claim **11**, wherein the first partition is affixed to the first wall or to the second wall, wherein:

the second partition has an articulated joint with the first partition wherein the third vertical edge articulates with the second vertical edge;

the third partition has an articulated joint with the first partition wherein the fifth vertical edge articulates with the first vertical edge; or

the third partition has an articulated joint with the second partition wherein the sixth vertical edge articulates with the fourth vertical edge; and

the first partition, second partition and the third partition are to be configured to form a closed polygon surrounding the interior space when the sixth edge of the third partition is adjacent to the second edge of the first partition, or the fifth edge of the third partition is adjacent to the fourth edge of the second partition.

15. The system of claim **11**, wherein the protective enclosure is a stand-alone structure, wherein the protective enclosure is detached from the first wall and from the second wall.

16. The system of claim **11**, further comprising a fourth partition between the second and third partitions, wherein the first partition is affixed to the first wall and the second partition is affixed to the second wall, wherein the first wall has a joint with the second wall, wherein:

the fourth partition comprises a seventh vertical edge and an opposing eighth vertical edge;

the third partition has an articulated joint with the first partition wherein the fifth vertical edge articulates with the first vertical edge;

the fourth partition has an articulated joint with the second partition wherein the eighth vertical edge articulates with the fourth vertical edge; or

the fourth partition has an articulated joint with the third partition wherein the seventh vertical edge articulates with the sixth vertical edge; and

the first, second, third and fourth partitions are to be configured to form a closed polygon surrounding the interior space when the seventh vertical edge of the fourth partition is adjacent to the sixth vertical edge of the third partition or the eighth vertical edge of the fourth partition is adjacent to the fourth vertical edge of the second partition.

17. The system of claim **11**, further comprising a fourth partition between the second and third partitions, the fourth partition having a seventh vertical edge and an opposing eighth vertical edge, wherein:

the first partition is affixed to the first wall or to the second wall;

the second partition has an articulated joint with the first partition wherein the third vertical edge articulates with the second vertical edge;

the third partition has an articulated joint with the first partition wherein the fifth vertical edge articulates with the first vertical edge; and

the fourth partition has an articulated joint with the second partition wherein the eighth vertical edge articulates with the fourth vertical edge; or

the fourth partition has an articulated joint with the third partition wherein the seventh vertical edge articulates with sixth vertical edge; and

the first, second, third and fourth partitions are to be configured to form a closed polygon surrounding the interior space when the seventh vertical edge of the fourth partition is adjacent to the sixth vertical edge of the third partition or the eighth vertical edge of the fourth partition is adjacent to the fourth vertical edge of the second partition.

18. The system of claim **11**, wherein the plurality of cables comprises six or more cables, each cable having a first end affixed to a first horizontal edge at the top of the first partition and extendable to a first plurality of receiving structures proximal to a second horizontal edge at the top of the second partition and to a second plurality of receiving structures proximal to a third horizontal edge at the top of the third partition, and wherein each cable of the six or more cables has a second end that is attachable to the first plurality of receiving structures and to the second plurality of receiving structures.

19. The system of claim **11**, further comprising a fourth partition between the second and third partitions, wherein:

the first partition is opposite the fourth partition and the second partition is opposite the third partition;

the plurality of cables comprises six or more cables;

at least three cables of the six or more cables having a first end affixed to the first partition and a second end extendable to a first plurality of receiving structures near the top of the third partition; and

at least three cables of the six or more cables having a first end that is affixed to the second partition and a second end extendable to a second plurality of receiving structures near the top of the fourth partition.

20. The system of claim **11**, further comprising a fourth partition between the second partition and the third partition, wherein the fourth partition has a seventh vertical edge and an opposing eighth vertical edge, wherein:

the first wall has a joint with the second wall;

the first partition is affixed to the first wall and the second partition is affixed to the second wall;

the fifth vertical edge of the third partition articulates with the first vertical edge of the first partition;

the eighth vertical edge of the fourth partition articulates with the fourth vertical edge of the second partition;

the third partition and the fourth partition each have a length that is substantially one half of the distance between the first vertical edge of the first partition and the fourth vertical edge of the second partition; and

the first, second, third and fourth partitions are to be configured to form a closed polygon surrounding the interior space when the seventh vertical edge of the fourth partition is adjacent to the sixth vertical edge of the third partition.

* * * * *